

# The Great Basin Naturalist

PUBLISHED AT PROVO, UTAH, BY  
BRIGHAM YOUNG UNIVERSITY

ISSN 0017-3614

VOLUME 43

April 30, 1983

No. 2

## UTAH FLORA: COMPOSITAE (ASTERACEAE)

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**ABSTRACT.**— A revision of the sunflower family, Compositae (Asteraceae), is presented for the state of Utah. Included are 613 taxa in 100 genera. Keys to genera, species, and infraspecific taxa are provided, along with detailed descriptions, distributional data, and pertinent discussion. Many nomenclatural changes have been necessary to bring Utah composites into line with contemporary interpretations of the family. They include: *Artemisia tridentata* Nutt. var. *wyomingensis* (Beetle & Young) Welsh; *Aster kingii* D.C. Eaton var. *barnebyana* (Welsh & Goodrich) Welsh; *Brickellia microphylla* (Nutt.) Gray var. *watsonii* (Robins.) Welsh; *Chrysothamnus nauseosus* (Pallas) Britt. — var. *abbreviatus* (Jones) Welsh, var. *arenarius* (L.C. Anderson) Welsh, var. *glareosus* (Jones) Welsh, var. *iridis* (L.C. Anderson) Welsh, and var. *nitidus* (L.C. Anderson) Welsh; *Cirsium arizonicum* (Gray) Petrak var. *nidulum* (Jones) Welsh; *Cirsium calcareum* (Jones) Woot. & Standl. — var. *bipinnatum* (Eastw.) Welsh and var. *pulchellum* (Greene) Welsh; *Cirsium neomexicanum* Gray var. *utahense* (Petrak) Welsh; *Cirsium undulatum* (Nutt.) Spreng. var. *tracyi* (Rydb.) Welsh; *Crepis runcinata* (James) T. & G. var. *glauca* (Nutt.) Welsh; *Erigeron speciosus* (Lindl.) DC. — var. *mollis* (Gray) Welsh and var. *uintahensis* (Cronq.) Welsh; *Gutierrezia petradoria* (Welsh & Goodrich) Welsh; *Gutierrezia pomariensis* (Welsh) Welsh; *Haplopappus racemosus* (Nutt.) Torr. — var. *sessiliflorus* (Greene) Welsh and var. *prionophyllus* (Greene) Welsh; *Haplopappus watsonii* Gray var. *rydbergii* (Blake) Welsh; *Lygodesmia grandiflora* (Nutt.) T. & G. — var. *arizonica* (Tomb) Welsh and var. *dianthopsis* (D.C. Eaton) Welsh; *Machaeranthera canescens* (Pursh) Gray — var. *commixta* (Greene) Welsh, var. *leucanthemifolia* (Greene) Welsh, and var. *vacans* (A. Nels.) Welsh; *Petradoria pumila* (Nutt.) Greene var. *graminea* (Woot. & Standl.) Welsh; and *Senecio spartioides* T. & G. var. *multicapitatus* (Greenm. in Rydb.) Welsh.

This paper is one of a series of works leading to a definitive treatment of the flora of Utah. Previous papers have dealt with the Brassicaceae, Fabaceae, Rosaceae, and miscellaneous smaller families.

The sunflower family has long been recognized for its great size and complexity both in Utah and elsewhere; it is probably the largest flowering plant family on earth. In Utah it consists of 100 genera and 613 taxa, of which some 40, or about 7 percent, are introduced. The 573 indigenous taxa comprise about 20 percent of the flora native to the state. This large family is apparently unique in total numbers, but is also unique in having such a small proportion of adventive taxa. The figures are misleading, to an extent, because of the omission of numerous cultivated

ornamentals. Few actual crop or food plants are derived from members of this family. Only lettuce and sunflower are grown as crops or as garden plants from the vast array of species in this great family. Despite the paucity of food plants, there are many ornamental species. These have been included in the present treatment only when they have escaped, or when they have been planted routinely for many years, and when specimens have been preserved in the herbarium. The cultivated flora requires a separate intensive effort not herein attempted.

The importance of members of this family to wildlife, both as cover and as food, is well known by range managers. Despite the presence of chemical substances produced by the plants, which impart unpleasant flavors or

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even poisonous substances, many of them are eaten by both wildlife and by livestock. Sagebrush and rabbitbrush species are well known for their value in reclamation of sites requiring rehabilitation.

Negative values are reflected in the weedy species that occupy cultivated lands, in the mechanically injurious species (such as thistles and their relatives), and in the numerous poisonous kinds. Livestock losses have been reported in literature from utilization of species of the family, i.e., *Baileya*, *Hymenoxys* (especially *richardsonii*), *Oxytenia acerosa*, *Psilostrophe*, *Senecio*, and *Tetradymia*. Other plants are rendered unpalatable by their complex biochemical compounds, and they tend to increase on range lands where other more palatable plants are eaten selectively. *Gutierrezia* and *Chrysothamnus* species fit this latter category, although selected phases of the same *Chrysothamnus* species might be palatable or differentially palatable. Certainly there is much room for investigation of members of this huge assemblage.

The largest genus, and one of the most complex taxonomically, is *Erigeron*, with more than 60 taxa. Without the able monograph by Cronquist, and lacking his cooperative help, the species of *Erigeron* would have been much more difficult to interpret. Because of his knowledge, his dedication, and his helpful cooperation, this treatment is dedicated to him. The same kinds of problems, made even more complicated by extensive hybridization, is true for *Senecio*, which Barkley has treated so competently. Fortunately, monographs or revisions are available for most of the larger genera. However, no modern work is definitive for *Aster*, which requires interpretation on a cosmopolitan, rather than provincial, basis. Also, *Artemisia* has not been treated in its entirety for several decades. Much research on the nature of the biochemical constituents of *Artemisia* has shed light on the taxonomy of the group.

Difficulties in the composite genera and species, aside from those involving the great number of taxa, include those due to hybridization, ploidy level, and apomixis. Blending of morphological forms due to hybridization, subtle changes due to variations in chromosome sets, and the problems of interpretation

of apomictic races each lead to problems not easily soluble. And the end results are subject to a variety of preliminary conclusions, each subject to change as additional information becomes available. Further, generic lines in the family are not definitive, with aggregations of species sometimes representing convenience rather than actual affinities. Recent workers have tended to segregate traditional genera into finer subunits or additional genera. This seems to represent a continuing trend, and it seems probable that some of the genera treated herein will be broken up in the future. The weight of evidence for doing so lies with the future workers. Those who find it modern to give "new" generic interpretations are often merely opting previous workers, whose interpretations were flawed. Another later generation will opt for a different set of names based on what they consider to be "modern."

Some of the species are edaphic specialists, occurring on definite substrates of restricted aerial or elevational distribution. The woody asters (*Xylorhiza*) are selenophytes and are restricted to shales and silt- and mudstones of fine-textured geological formations in eastern to southwestern Utah.

The present work should be considered tentative at best. Despite the large number of specimens available for study (13,700), many of the taxa are imperfectly known and distributions are yet to be understood. Monographic work is required for practically all groups, whether completed in the recent past or not. It is hoped that this work will provide a useful summary for those who work with Utah composites.

To the extent possible the work presented below contains the most modern names for the entities involved, based on application of contemporary International Rules of Botanical Nomenclature. Following the name of the entities are the synonyms that apply to Utah plants specifically. No attempt has been made to list synonymy exhaustively. The basionym has been included more or less uniformly, and an attempt has been made to cite all synonyms based on Utah plants, including a brief notation of type locality.

The discussion following the description of each species, or the name of the infraspecific taxon, includes the plant communities in



which the taxon occurs. They are arranged in ascending order from dry low elevation communities to mesic high elevation communities. Community data is followed by elevational range (given in meters), counties of known occurrence (in alphabetical order), and the distribution outside Utah. At the end of the discussion are two numbers, the first, in Arabic numerals, indicates the number of Utah specimens examined for the taxon and the second, in Roman numerals, is the number collected in Utah by the author. The numbers are given to provide the reader with the basis of understanding of the taxon by the writer and his familiarity with the plants in the field. The plants are not equally well known by this writer, and the user should be able to make judgements when the taxonomy presented herein does not adequately approach the conditions as noted in the field. The approach to reality is always an approximation, and much improvement will take place in the future, as more information is derived from specimens not now available for the present study.

COMPOSITAE (ASTERACEAE)

Sunflower Family

Annual, biennial, or perennial herbs, or shrubs; leaves alternate, opposite, or whorled, simple, pinnatifid, or compound; in-

florescence of involucrate heads, these solitary or several in corymbose, racemose, paniculate, or cymose clusters; flowers few to numerous on a common receptacle, surrounded by green bracts forming a cup-shaped, cylindrical, or urn-shaped involucre enclosing the flowers in bud; heads entirely of tubular (disk) corollas, entirely of ligulate (ray) corollas, or with tubular corollas forming a central disk and an outer radiating row of ligulate corollas; receptacle flat, convex, conic, or cylindric, naked or bearing chaffy bracts, scales, or hairs; calyx lacking, or crowning the summit of the ovary and modified as a pappus of capillary bristles, scales, or awns; stamens alternate with corolla lobes; filaments free (rarely connate); the anthers united and forming a tube (rarely separate); ovary inferior, of 2 carpels, 1-loculed and with a single ovule; styles 1, 2-cleft, exerted through the anther tube; fruit an achene. **Note:** All involucre measurements are from dried pressed herbarium specimens. The width measurements are sometimes broader than in fresh material.

ARNOW, L., B. ALBEE, AND A. WYCKOFF. 1980. Flora of the central Wasatch Front, Utah. Univ. of Utah Printing Service, Salt Lake City. 663 pp.

MEYER, S. E. 1976. Annotated checklist of the vascular plants of Washington County, Utah. Unpublished thesis, Univ. of Nevada, Las Vegas. 276 pp.

- 1. Corollas all raylike; plants usually with milky juice ..... **KEY I**
- Corollas not all raylike, some or all of them tubular; juice seldom if ever milky ..... **2**
- 2(1). Corollas all tubular; no ray flowers present, or the rays vestigial and minute ..... **KEY II**
- Corollas not all tubular; ray flowers present ..... **3**
- 3(2). Pappus of capillary bristles, at least in part ..... **KEY III**
- Pappus of awns or scales, or lacking ..... **4**
- 4(3). Pappus lacking ..... **KEY IV**
- Pappus present, of awns or scales ..... **KEY V**

**KEY I.**

Corollas all raylike; plants usually with milky juice.

- 1. Pappus lacking ..... **2**
- Pappus present ..... **3**

- 2(1). Rays 10–20 mm long; plants glabrous, with leaves in basal rosette ..... *Atrichoseris*  
 — Rays 5–7 mm long; plants pubescent, with well-developed cauline leaves .... *Lapsana*
- 3(1). Pappus, at least in part, of plumose bristles ..... 4  
 — Pappus of simple bristles, of awns, or of scales ..... 7
- 4(3). Plants acaulescent, with merely bracteate stems ..... *Hypochaeris*  
 — Plants caulescent ..... 5
- 5(3). Achenes not beaked, truncate at apex; involucre usually less than 15 mm long  
 ..... *Stephanomeria*  
 — Achenes tapering or beaked at apex; involucre usually more than 15 mm long ..... 6
- 6(5). Leaves pinnatifid; corollas white or pinkish; involucre with an outer series of  
 short bractlets; southern Utah ..... *Rafinesquia*  
 — Leaves not pinnatifid, entire; corollas yellow or purplish; involucre lacking  
 short outer bractlets; widespread ..... *Tragopogon*
- 7(3). Pappus of 1–3 series of unawned or awned scales ..... 8  
 — Pappus of capillary bristles ..... 9
- 8(7). Pappus of 2 or 3 series of unawned scales; corollas blue, closing by mid-  
 morning ..... *Cichorium*  
 — Pappus scales in a single series, awned; corollas yellow, not closing by mid-  
 morning ..... *Microseris*
- 9(7). Achenes more or less flattened; stems leafy; heads in panicles or in umbellate  
 clusters ..... 10  
 — Achenes not flattened; stems leafy or scapose; heads solitary or variously dis-  
 posed ..... 11
- 10(9). Involucres cylindric or ovoid-cylindric; achenes beaked; flowers yellow or  
 blue ..... *Lactuca*  
 — Involucres broadly campanulate to hemispheric; achenes not beaked; flowers  
 yellow ..... *Sonchus*
- 11(9). Corollas pink or purplish ..... 12  
 — Corollas yellow or yellowish, or white or cream colored ..... 14
- 12(11). Plants annual; heads mainly 5–7 mm long (from base of involucre to tip of  
 pappus) ..... *Prenanthes*  
 — Plants perennial; heads mainly 8–20 mm long or more ..... 13
- 13(12). Plants with rigid spine-tipped branches ..... *Stephanomeria*  
 — Plants unarmed, the branches soft ..... *Lygodesmia*
- 14(11). Leaves all basal; heads solitary on scapose peduncles ..... 15  
 — Leaves not all basal, the stems leafy; heads not on scapose peduncles ..... 17
- 15(14). Achenes not beaked, truncate; pappus bristles barbellate ..... *Microseris*  
 — Achenes beaked or tapering to apex; pappus not of barbellate bristles ..... 16
- 16(15). Achenes 10-ribbed or 10-nerved, not spinulose; involucral bracts usually imbric-  
 ated in several series ..... *Agoseris*  
 — Achenes 4- to 5-ribbed, spinulose, especially near apex; principal bracts in a  
 single series, the outer much shorter ..... *Taraxacum*

17(14). Achenes ridged or tuberculate between the angles; leaves either crustaceous margined or peduncles stipitate-glandular; southwestern Utah ..... 18

— Achenes striate between the angles; leaves and peduncles otherwise (rarely glandular setose in some *Crepis* species); widely distributed ..... 19

18(17). Plants depressed annuals with crustaceous-margined leaves, not stipitate-glandular; achenes abruptly beaked, transversely ridged between the ribs ..... *Glyptopleura*

— Plants erect, lacking crustaceous-margined leaves, conspicuously stipitate-glandular above; achenes tapering to a beak, not transversely ridged ..... *Calycoseris*

19(17). Pappus bristles early deciduous, more or less united below and falling together, only a few of the stout outer ones may be persistent ..... *Malacothrix*

— Pappus bristles persistent or tardily deciduous, and then falling separately ..... 20

20(19). Pappus tan to brown; involuclral bracts not thickened ..... *Hieracium*

— Pappus white or whitish; involuclral bracts somewhat thickened at base or on midrib ..... *Crepis*

KEY II.

Corollas all tubular; no ray flowers present.

1. Heads unisexual, the pistillate heads with 1–4 flowers enclosed in involucre; involucre burlike or nutlike, only style tips exerted ..... 2

— Heads perfect or unisexual; involucre not burlike or nutlike ..... 4

2(1). Involuclral bracts of the staminate heads separate; fruiting involuclres burlike, covered with hooked appendages ..... *Xanthium*

— Involuclral bracts of the staminate heads united; fruiting involuclres various but, if burlike, lacking hooked appendages ..... 3

3(2). Shrubs; fruiting involucre with several transverse, scarious wings; leaves or their lobes linear-filiform ..... *Hymenoclea*

— Shrubs or herbs; fruiting involucre lacking transverse wings; leaves and their lobes not linear-filiform ..... *Ambrosia*

4(1). Stamens not united by their anthers; flowers always unisexual, the pistillate corollas none or much reduced ..... 5

— Stamens with united anthers or rarely not united in some species with perfect flowers, at least some flowers usually perfect ..... 7

5(4). Achenes long-villous; leaves or their lobes linear-filiform ..... *Oxytenia*

— Achenes not long-villous; leaves or their lobes not linear-filiform ..... 6

6(5). Pistillate flowers subtended by large, chaffy scales simulating inner involuclral bracts; achenes with pectinate or winged margins ..... *Dicoria*

— Pistillate flowers subtended by chaffy scales or these lacking; achenes without pectinate or toothed wings ..... *Iva*

7(4). Involuclral bracts with translucent, usually yellow or orange dots ..... *Porophyllum*

— Involuclral bracts without distinct dots; pappus various, but not as above ..... 8

8(7). Pappus of capillary bristles, at least in part, these smooth, scabrous, barbellate, or plumose ..... 9

— Pappus lacking or, if present, not of capillary bristles ..... 41



- 9(8). Leaves opposite or whorled, some or all cauline ..... 10  
 — Leaves alternate, at least basally, or basal and actually alternate ..... 13
- 10(9). Corollas yellow; involucre bracts in 1 series or in 2 series, but all equal in length ..... *Arnica*  
 — Corollas white, ochroleucous, flesh colored, blue, or purple; involucre bracts in 2 to several series ..... 11
- 11(10). Pappus double—the outer series of short scales, the inner series of capillary bristles; shrubs with white bark ..... *Hofmeistera*  
 — Pappus single, or else plants herbaceous; shrubs or herbs ..... 12
- 12(11). Achenes 5-angled or 5-ribbed; involucre bracts subequal or in 2 series ... *Eupatorium*  
 — Achenes 10-angled or 10-ribbed; involucre bracts imbricated in several series of different lengths ..... *Brickellia*
- 13(9). Leaves spinescent, usually with spiny teeth or lobes, rarely entire but then with spine-tipped apex, thistlelike ..... 14  
 — Leaves entire, denticulate or lobed, lacking spines, not thistlelike ..... 18
- 14(13). Corollas of some or all flowers bilabiate; basal leaf axils woolly; leaves spinulose-dentate; flowers pink; arid sites in Kane and Washington counties ..... *Perezia*  
 — Corollas not bilabiate; leaves not or seldom spinulose-dentate; basal leaf axils woolly; flowers pink-white or cream; various distribution ..... 15
- 15(14). Pappus of 2 series of awns, the outer long and naked, the inner short and hispidulous; flowers yellow ..... *Cnicus*  
 — Pappus of plumose or barbellate capillary bristles; flowers not yellow ..... 16
- 16(15). Pappus bristles plumose (rarely some otherwise); receptacle densely bristly .. *Cirsium*  
 — Pappus bristles merely barbellate ..... 17
- 17(16). Receptacle densely bristly, not fleshy or honeycombed; heads nodding ..... *Carduus*  
 — Receptacle not bristly or scarcely so, fleshy and honeycombed; heads not nodding ..... *Onopordium*
- 18(13). Receptacle with dense bristles or narrow, chaffy scales between disk flowers ..... 19  
 — Receptacle naked or at most short-hairy, never with dense bristles or scales ..... 21
- 19(18). Involucre bracts with hooked spines; lower leaves large (resembling rhubarb), cordate at base ..... *Arctium*  
 — Involucre bracts without spines, or spines not hooked; lower leaves not large and cordate at base ..... 20
- 20(19). Receptacle chaffy except in center; plants small, woolly ..... *Filago*  
 — Receptacle chaffy throughout; plants not small and woolly ..... *Centaurea*
- 21(20). Heads unisexual; plants dioecious (staminate flowers may have styles but ovary does not develop) ..... 22  
 — Heads with at least central flowers perfect ..... 24
- 22(21). Plants shrubs or else woody at base, not tomentose; leaves sometimes toothed or lobed; involucre bracts not strongly scarious margined ..... *Baccharis*  
 — Plants herbaceous, more or less tomentose; leaves entire; involucre bracts strongly scarious, at least along margins ..... 23
- 23(22). Pappus bristles of pistillate flowers united at base and falling together; pappus bristles of staminate flowers usually club shaped at apex; plants usually less than 30 cm tall; basal leaves commonly in a rosette; cauline leaves reduced and different in shape; leaves usually tomentose on both sides ..... *Antennaria*

- Pappus of pistillate flowers separate at base and falling separately; pappus bristles of staminate flowers not club shaped at apex; plants mostly over 30 cm tall; leaves all alike, usually green and glabrate above ..... *Anaphalis*
- 24(21). Stems longitudinally brown-striate; involuclral bracts imbricate, chartaceous, the inner with scarious margins and broadly rounded apices; shrubs with yellow flowers, of western Millard County ..... *Lepidospartum*
- Stems striate or not; involuclral bracts scarious, hyaline, or herbaceous but not as above; herbs, or shrubs with flowers and distribution various ..... 25
- 25(24). Involuclral bracts scarious or hyaline (only partly so in *Pluchea*) ..... 26
- Involuclral bracts herbaceous, at least in the center ..... 28
- 26(25). Involuclral bracts subscarious; corollas purplish; plants not tomentose, slender woody shrubs ..... *Pluchea*
- Involuclral bracts scarious; corollas rarely purplish; plants tomentose, prostrate to erect herbs ..... 27
- 27(26). Plants perennial, subdioecious pistillate heads usually with a few central, perfect flowers ..... *Anaphalis*
- Plants annual or perennial, not dioecious; heads all alike, the marginal flowers pistillate and central ones perfect ..... *Gnaphalium*
- 28(25). Involuclral bracts in a single series, a few very short ones may be present at the very base ..... 29
- Involuclral bracts of 2 or more series, these often of different lengths ..... 32
- 29(28). Plants woody, shrubs; involuclral bracts 4–6 per head ..... *Tetradymia*
- Plants herbaceous; bracts more than 6 per head ..... 30
- 30(29). Plants annual; heads with inner flowers perfect, the outer pistillate ..... *Conyza*
- Plants perennial; heads with all flowers perfect ..... 31
- 31(30). Style branches with a tuft of hairs near the truncate apex; involuclral bracts in 1 series only (a few short bracts may be present) ..... *Senecio*
- Style branches without a tuft of hairs near the truncate apex; involuclral bracts actually in 2 or more series ..... *Erigeron*
- 32(28). Pappus double, the outer series of short scales, the inner ones of capillary bristles; shrubs with white bark ..... *Hofmeistera*
- Pappus simple or else the plants herbaceous ..... 33
- 33(32). Plants annual ..... 34
- Plants perennial ..... 36
- 34(33). Plants low, depressed, scurfy pubescent herbs; leaves broadly ovate or roundish, entire or toothed ..... *Psathyrotes*
- Plants not as above ..... 35
- 35(34). Leaves all entire ..... *Aster*
- Leaves toothed or lobed, at least the lower ..... *Conyza*
- 36(33). Involuclral bracts in more or less distinct vertical rows ..... *Chrysothamnus*
- Involuclral bracts not in vertical rows ..... 37
- 37(36). Involuclral bracts usually in 1 subequal series ..... *Erigeron*
- Involuclral bracts imbricate, in 2 or more series ..... 38

- 38(37). Involucral bracts not longitudinally striate; flowers commonly yellow .. *Haplopappus*  
 — Involucral bracts longitudinally striate; flowers commonly cream to off-white,  
 or pink to purplish ..... 39
- 39(38). Flowers pink to purplish; plants of northwestern Utah ..... *Eupatorium*  
 — Flowers cream to white; plants of various distribution ..... 40
- 40(39). Pappus plumose; plants perennial herbs ..... *Kuhnia*  
 — Pappus scabrous or hispidulose; plants shrubs or herbs ..... *Brickellia*
- 41(9). Receptacle with bristles or chaffy scales among the flowers ..... 42  
 — Receptacle naked or merely short-hairy ..... 50
- 42(41). Receptacle densely bristly ..... *Centaurea*  
 — Receptacle with chaffy scales ..... 43
- 43(42). Plants low woolly annuals; outer bracts boat shaped and enclosing the achenes ..... 44  
 — Plants various, but not low and woolly; outer bracts various but not usually en-  
 closing the achenes ..... 45
- 44(43). Stem leaves opposite; style lateral ..... *Psilocarpus*  
 — Stem leaves alternate; style terminal ..... *Stylocline*
- 45(43). Involucral bracts in 2 distinct sets — the outer herbaceous, the inner differing  
 in shape and texture; leaves opposite, at least below, or alternate ..... 46  
 — Involucral bracts not in 2 unlike sets; leaves alternate or basal ..... 47
- 46(45). Leaves alternate throughout; outer involucral bracts about 5, spreading, her-  
 baceous, the inner (1-3 subtending pistillate flowers) larger and broader, be-  
 coming strongly accrescent and hooded in fruit ..... *Dicoria*  
 — Leaves opposite, at least below; outer involucral bracts various, but not as  
 above, not accrescent and hooded in fruit ..... *Thelesperma*
- 47(45). Involucral bracts in 1 series, boat shaped, each bract enclosing a marginal  
 flower; rays short, yellow ..... *Madia*  
 — Involucral bracts in 1 or more series, not boat shaped and enclosing marginal  
 flowers; rays lacking ..... 48
- 48(47). Plants woody shrubs; mostly along the canyons of the Colorado and Green riv-  
 ers ..... *Encelia*  
 — Plants herbaceous; widely distributed ..... 49
- 49(48). Receptacles high-conical, mostly over 3 cm long; stems leafy ..... *Rudbeckia*  
 — Receptacles merely convex, much less than 3 cm long; leaves all basal ..... *Enceliopsis*
- 50(41). Pappus none ..... 51  
 — Pappus present ..... 54
- 51(50). Leaves opposite, some cauline, somewhat connate at base; plants of Grand, San  
 Juan, and Tooele counties ..... *Flaveria*  
 — Leaves alternate or basal ..... 52
- 52(51). Heads numerous, in spikes, racemes, or panicles; anthers with acute tips; re-  
 ceptacles flat; plants woody or herbaceous ..... *Artemisia*  
 — Heads solitary on ends of stems, or sometimes corymbose or capitate; anthers  
 with rounded tips; receptacles convex or conic; plants herbaceous, or woody  
 only at base ..... 53



53(52).	Plants annual; heads solitary or paniculately arranged; leaves green and glabrous .....	<i>Chamomilla</i>
—	Plants perennial; heads corymbose or capitate; leaves usually silvery-canescant .....	<i>Chrysanthemum</i>
54(50).	Plants dioecious shrubs .....	<i>Baccharis</i>
—	Plants not dioecious herbs or shrubs .....	55
55(54).	Pappus of 2–8 caducous awns; plants usually strongly glutinous .....	<i>Grindelia</i>
—	Pappus various, but not of 2–8 caducous awns .....	56
56(55).	Leaves and involucre conspicuously punctate with translucent oil glands ...	<i>Dyssodia</i>
—	Leaves and involucre sometimes impressed-punctate, but without translucent oil glands .....	57
57(56).	Pappus of 12 or more scale or bristlelike segments, these nearly or quite as long as achene .....	58
—	Pappus of fewer than 12 scalelike segments or else much shorter than achene .....	59
58(57).	Pappus of 12–16 linear, acuminate awns; involucre glutinous; leaves 3- to 5-nerved .....	<i>Vancleavea</i>
—	Pappus of ca 35 flattened, silvery scales and bristles of different widths; involucre not glutinous; leaves 1-nerved .....	<i>Acamptopappus</i>
59(57).	Achenes strongly compressed; pappus of 1 or 2 slender awns .....	<i>Laphamia</i>
—	Achenes not compressed or, if so, then pappus not of 1 or 2 slender awns .....	60
60(59).	Pappus a crown with margins entire or of short scales united into a crown .....	61
—	Pappus not as above .....	63
61(60).	Plants annual; heads solitary or paniculately arranged; flowers all perfect; leaves green and glabrous .....	<i>Chamomilla</i>
—	Plants perennial; heads corymbose or capitate, rarely solitary; some marginal flowers pistillate only; leaves mostly silvery-canescant .....	62
62(61).	Plants 0.5–1 m tall; leaves doubly pinnately dissected, mainly 10–20 cm long ...	<i>Tanacetum</i>
—	Plants mainly less than 0.3 m tall; leaves entire, once pinnately dissected, ternate, merely toothed apically, or entire, mainly less than 10 cm long ...	<i>Sphaeromeria</i>
63(60).	Involucral bracts with a thin, scarious, white, yellow, or purplish margin and tip .....	<i>Hymenopappus</i>
—	Involucral bracts without a scarious, colored margin and tip .....	64
64(63).	Plants scapose; leaves roundish, entire, or crenate .....	<i>Chamaechaenactis</i>
—	Plants leafy stemmed; leaves not roundish and entire or subentire .....	65
65(64).	Pappus scales with a strong midrib; leaves lanceolate or linear, entire; southern Utah .....	<i>Palafoxia</i>
—	Pappus scales nerveless or essentially so; leaves, at least in part, toothed to pin-natifid; widely distributed .....	<i>Chaenactis</i>

KEY III.

Corollas not all tubular; ray flowers present pappus of capillary bristles.

1.	Rays white, pink, violet, or purple, not yellow .....	2
—	Rays yellow or orange-yellow .....	9

- 2(1). Pappus of numerous unequal bristles, alternating with shorter, lacerate scales; involucre bracts subequal; low winter annuals ..... *Monoptilon*
- Pappus of numerous bristles; involucre bracts imbricate or subequal; plants various, but seldom low winter annuals ..... 3
- 3(2). Pappus, at least of disk flowers, of several to many rigid bristles; achenes pubescent with 2-forked hairs or the hairs barbed at apex ..... *Townsendia*
- Pappus, at least of disk flowers, of many capillary bristles, at least in part; achenes glabrous or pubescent with simple hairs ..... 4
- 4(3). Rays very inconspicuous, shorter than the tube and scarcely if at all exceeding their pappus; central perfect flowers few; plants annual ..... *Conyza*
- Rays usually conspicuous, longer than the tube and pappus; central perfect flowers several to many; plants annual, biennial, or perennial ..... 5
- 5(4). Involucres subequal, rarely somewhat graduated; rays usually narrow; style tips very short, triangular, rounded, or obtuse ..... *Erigeron*
- Involucres usually strongly graduated; rays comparatively broad; style tips ovate and acute to subulate, usually lanceolate ..... 6
- 6(5). Plants perennial, rhizomatous, or annual, or, if from a caudex, ordinarily less than 10 cm tall (see also *Aster kingii*) ..... 7
- Plants from a caudex or taproot ..... 8
- 7(6). Low, white-rayed perennial herbs from spreading cordlike rootstocks, in arid sites; flowering in springtime ..... *Leucelene*
- Low to tall, white- to pink- or purple-rayed annual or perennial herbs from rhizomes or fibrous roots (a caudex in *A. kingii*); mainly flowering in summer and autumn ..... *Aster*
- 8(6). Plants herbaceous, from a taproot, biennial or perennial; heads usually several to numerous ..... *Machaeranthera*
- Plants more or less woody, from a ligneous caudex; heads usually solitary and large (primary selenophytes) ..... *Xylorhiza*
- 9(1). Leaves opposite, at least below ..... 10
- Leaves alternate throughout ..... 12
- 10(9). Plants subshrubs ..... *Laphamia*
- Plants herbaceous ..... 11
- 11(10). Leaves with stiff marginal bristles; involucre and leaves with conspicuous oil glands; plants annual ..... *Pectis*
- Leaves without stiff marginal bristles; involucre and leaves without oil glands; plants perennial ..... *Arnica*
- 12(11). Plants 1–1.5 m tall, herbaceous; heads 3–5 cm wide; rays 1–2 cm long ..... *Inula*
- Plants various, usually less than 1 m tall, or, if taller, woody; heads much smaller; rays seldom to 1 cm long ..... 13
- 13(12). Pappus of 2–8 stiff, caducous bristles; plants usually glutinous ..... *Grindelia*
- Pappus of numerous, usually soft, persistent bristles ..... 14
- 14(13). Pappus of about 20 twisted, flattish bristles ..... *Amphipappus*
- Pappus of numerous, straight, capillary bristles ..... 15
- 15(16). Pappus double, the inner of numerous bristles, the outer sometimes scalelike ..... 16
- Pappus not double, of subequal capillary bristles only ..... 17

16(15). Leaves essentially filiform ..... *Conyza*  
— Leaves not filiform, linear-oblong or broader ..... *Heterotheca*  
17(15). Involucral bracts in distinct vertical ranks ..... 18  
— Involucral bracts not in distinct vertical ranks ..... 19  
18(19). Outer involucral bracts with loose herbaceous tips; erect stems perennial;  
plants shrubs; leaves deciduous ..... *Chrysothamnus*  
— Outer involucral bracts without loose herbaceous tips; erect stems annual;  
plants herbaceous; leaves persistent ..... *Petradoria*  
19(17). Involucral bracts in 1 series, frequently with some smaller bracts at base; style  
branches truncate apically ..... *Senecio*  
— Involucral bracts neither in 1 series nor with smaller bracts at base; style  
branches without truncate tips ..... 20  
20(19). Heads small, the involucre usually less than 6 mm high, usually very numerous  
and densely paniculate, rarely racemose or corymbose; plants rhizomatous,  
fibrous rooted ..... *Solidago*  
— Heads medium to large, the involucre usually more than 6 mm high, neither  
very numerous nor densely paniculate; plants with taproots, occasionally also  
rhizomatous ..... *Haplopappus*

Key IV.

Corollas not all tubular; ray flowers present; pappus lacking.

1. Rays white, pink, or pink-purple, sometimes yellow at base ..... 2  
— Rays yellow, sometimes partly purplish or maroon ..... 6  
2(1). Receptacle naked ..... 3  
— Receptacle with chaffy scales ..... 5  
3(2). Leaves all basal; plants scapose ..... *Bellis*  
— Leaves not all basal, at least some cauline; plants caulescent ..... 4  
4(3). Receptacle broad and flattish; involucral bracts with a dark brown submarginal  
line ..... *Chrysanthemum*  
— Receptacle convex, conic, or hemispheric; involucral bracts without a dark  
brown submarginal line ..... *Chamomilla*  
5(3). Heads small, numerous, in dense, flattish or rounded cymose panicles; plants  
perennial ..... *Achillea*  
— Heads comparatively large, solitary or few; plants annual or perennial ..... *Anthemis*  
6(1). Receptacles not chaffy ..... 7  
— Receptacles chaffy, at least toward the margin ..... 12  
7(6). Heads 1- or 2-flowered, in dense glomerate clusters, sessile in the forks of the  
stem, or terminal and leafy involucre ..... *Flaveria*  
— Heads several- to many-flowered, solitary on terminal peduncles ..... 8  
8(7). Plants woolly ..... 9  
— Plants not woolly ..... 10  
9(8). Rays persistent, becoming papery ..... *Baileya*  
— Rays not persistent ..... *Eriophyllum*



- 10(8). Involucre and leaves with translucent oil glands ..... *Pectis*  
 — Involucre and leaves without translucent oil glands ..... 11
- 11(10). Rays conspicuous; involucre bracts acuminate, without scarious margins ..... *Bahia*  
 — Rays minute; involucre bracts obtuse, with scarious margins ..... *Tanacetum*
- 12(6). Ray achenes partly or wholly enfolded by their involucre bracts; plants annual, glandular-viscid above ..... *Madia*  
 — Ray achenes not conspicuously enfolded by their involucre bracts or, if so, then plants perennial; plants perennial or, if annual, not glandular above ..... 13
- 13(12). Involucre distinctly double, the outer bracts herbaceous, the inner ones broader and united to about the middle ..... *Thelesperma*  
 — Involucre not double, the bracts distinct to the base ..... 14
- 14(13). Plants scapose perennials; leaves broad, silvery-pubescent, entire; heads very broad ..... *Enceliopsis*  
 — Plants leafy stemmed or subscapose; leaves various but not broad and silvery-pubescent, or if so, then sagittate; heads broad or narrow ..... 15
- 15(14). Plants subscapose; leaves variously dissected or sagittate; heads broad .. *Balsamorhiza*  
 — Plants with stems definitely leafy; leaves usually not dissected or sagittate ..... 16
- 16(15). Plants shrubby; achenes conspicuously ciliate on the margins, notched at the apex, very flat ..... *Encelia*  
 — Plants herbaceous; achenes not conspicuously ciliate on the margins ..... 17
- 17(16). Leaves doubly pinnately dissected; heads numerous in corymbose cymes ..... *Achillea*  
 — Leaves simple, entire or toothed to lobed; heads few to several ..... 18
- 18(17). Achenes 2-winged; disks 15–25 mm wide; leaves white-strigose beneath, green above ..... *Verbesina*  
 — Achenes not 2-winged; disks 6–15 mm wide; leaves green on both sides .... *Helionis*

### Key V.

Corollas not all tubular; ray flowers present; pappus of awns or scales.

1. Receptacle chaffy ..... 2  
 — Receptacle not chaffy, either naked or bristly ..... 17
- 2(1). Pappus scales fimbriate; ray flowers 4 or 5, white, only slightly surpassing the disk; introduced weedy plants, to be expected in Utah ..... *Galinsoga parviflora* Cav.  
 — Pappus scales or awns not fimbriate; ray flowers various in size and color; indigenous or introduced ..... 3
- 3(2). Receptacle bearing a row of chaffy scales between the ray flowers and the outer disk flowers, otherwise naked; pappus of 10–20 slender setiform scales ..... *Layia*  
 — Receptacle chaffy throughout; pappus not of 10–20 slender scales ..... 4
- 4(3). Ray achenes dorsiventrally compressed, the thickened margins attached to a contiguous pair of infertile disk flowers and the subtending bract, and falling as a unit; pulvinate herbs of eastern Utah and shrubs of southwestern Utah .....  
 ..... *Parthenium*  
 — Ray achenes various, but not as above; herbs or shrubs ..... 5
- 5(4). Pappus of awns only, without scales ..... 6  
 — Pappus, at least in part, of scales ..... 10

6(5).	Achenes flat and obcompressed; awns retrorsely hispid .....	<i>Bidens</i>
—	Achenes not obcompressed; awns not retrorsely hispid .....	7
7(6).	Achenes plump; pappus of 2 to several caducous awns .....	<i>Helianthus</i>
—	Achenes flat, very strongly compressed; pappus various .....	8
8(7).	Plants scapose; heads large, solitary .....	<i>Enceliopsis</i>
—	Plants leafy stemmed; heads medium sized, usually several .....	9
9(8).	Plants shrubby; achenes narrowly white margined, the margin not continuous between weak awns .....	<i>Encelia</i>
—	Plants herbaceous annuals; achenes strongly white margined, the margin continuous between stout awns .....	<i>Geraea</i>
10(5).	Achenes very flat, strongly compressed .....	11
—	Achenes not very flat, usually much thickened .....	13
11(10).	Leaves once to twice pinnatifid .....	<i>Anthemis</i>
—	Leaves not pinnatifid, entire or nearly so .....	12
12(11).	Plants scapose .....	<i>Enceliopsis</i>
—	Plants leafy stemmed .....	<i>Helianthella</i>
13(10).	Pappus caducous (of 2 awns and rarely some scales) .....	<i>Helianthus</i>
—	Pappus persistent .....	14
14(13).	Inner involuclral bracts united to middle into a cup .....	<i>Thelesperma</i>
—	Inner involuclral bracts not united into a cup .....	15
15(14).	Receptacle merely convex; rays pistillate .....	<i>Wyethia</i>
—	Receptacle conic or cylindric; rays neuter .....	16
16(15).	Involuclral bracts subequal, in 2 or 3 series .....	<i>Rudbeckia</i>
—	Involuclral bracts unequal, in 2 series, the inner ones shorter .....	<i>Ratibida</i>
17(1).	Rays white or purple .....	18
—	Rays yellow, sometimes marked with purple .....	24
18(17).	Pappus a short crown .....	19
—	Pappus of awns or scales .....	21
19(18).	Leaves entire or pinnately divided .....	<i>Chrysanthemum</i>
—	Leaves irregularly 2–3 times pinnately dissected .....	20
20(19).	Plants annual; heads 1–2.5 cm wide; receptacle conic, hollow .....	<i>Chamomilla</i>
—	Plants biennial or perennial; heads 3–5 cm wide; receptacle hemispheric .....	<i>Matricaria</i>
21(18).	Pappus of 1 plumose awn and a denticulate crown .....	<i>Monoptilon</i>
—	Pappus of 2 to several awns or scales .....	22
22(21).	Plants dwarf woolly annuals .....	<i>Eriophyllum</i>
—	Plants annual or perennial, not woolly .....	23
23(22).	Pappus of numerous awns or scales; involuclral bracts conspicuously scarious-margined .....	<i>Townsendia</i>
—	Pappus of 4 or 5 stiff awns; involuclral bracts obscurely scarious-margined .....	<i>Rigiopappus</i>
24(17).	Receptacle densely bristly or hairy .....	25
—	Receptacle naked .....	26

25(24).	Heads very small; involucre less than 10 mm wide .....	<i>Gutierrezia</i>
—	Heads medium sized; involucre more than 10 mm wide .....	<i>Gaillardia</i>
26(24).	Pappus of 4 hyaline scales united at the base; rays reddish purple to yellow ...	<i>Hulsea</i>
—	Pappus a crown, or of caducous or persistent awns or scales; rays mostly yellow .....	27
27(26).	Pappus a mere crown or of caducous awns .....	28
—	Pappus persistent, of awns or scales .....	30
28(27).	Pappus of 2-8 caducous awns; plants glutinous .....	<i>Grindelia</i>
—	Pappus a short crown; plants seldom if ever glutinous .....	29
29(28).	Leaves entire, bristly margined basally .....	<i>Pectis</i>
—	Leaves 2- or 3-pinnate .....	<i>Tanacetum</i>
30(27).	Pappus of 1 or 2 awns or scales (rarely more) with or without a crown .....	<i>Perityle</i>
—	Pappus of 4 to many awns or scales .....	31
31(30).	Pappus of about 20 slender, twisted awns; rays 1 or 2 small .....	<i>Amphipappus</i>
—	Pappus of 4-16 twisted or plane awns or scales; rays usually several .....	32
32(31).	Pappus of 4 or 5 stiff, narrowly lanceolate awns; achenes linear, transversely rugulose .....	<i>Rigiopappus</i>
—	Pappus of scales, awn-tipped scales, or setose-dissected awns .....	33
33(32).	Pappus of several scales dissected nearly to base; dwarf woolly annuals .....	<i>Syntrichopappus</i>
—	Pappus awns or scales not dissected or else plants perennial or woody .....	34
34(33).	Pappus of several more or less united scales; rays broad, papery, and persistent .....	<i>Psilostrophe</i>
—	Pappus not of united scales; rays not papery and persistent (occasionally so in <i>Hymenoxys</i> ) .....	35
35(34).	Leaves and involucre with conspicuous oil glands .....	<i>Dyssodia</i>
—	Leaves and involucre without conspicuous oil glands .....	36
36(35).	Achenes slender, elongate-clavate .....	37
—	Achenes stouter, oblong or obovoid .....	38
37(36).	Plants woolly .....	<i>Eriophyllum</i>
—	Plants merely strigose .....	<i>Platyschkuhrja</i>
38(36).	Involucral bracts spreading or reflexed; receptacle convex to subglobose; leaves decurrent .....	<i>Helenium</i>
—	Involucral bracts appressed; receptacle almost flat; leaves not decurrent .....	39
39(38).	Pappus of numerous scales; stems leafy; leaves linear or linear-spatulate, entire, 2.5 mm wide or less .....	<i>Gutierrezia</i>
—	Pappus of about 5 scales; leaves lobed or, if entire, broader and mostly or entirely basal .....	<i>Hymenoxys</i>

ACAMPTOPAPPUS Gray

Shrubs with white bark; leaves alternate, entire, 1-nerved; heads yellow, discoid, subglobose, cymose at tips of branches; flowers all fertile; involucral bracts ca 4-seriate,

strongly imbricate, the bracts broad, rounded, the tip greenish, the margin scarious, erose; receptacle convex, fimbriate; style branches linear; achenes sub-turbinate, densely villous; pappus persistent,



of ca 35 flattened silvery scales and bristles of different widths.

*Acamptopappus sphaerocephalus* (Harv. & Gray) Gray Goldenhead. [*Haplopappus sphaerocephalus* Harv. & Gray]. Low rounded shrubs to 1 m tall, much branched, glabrous throughout or scabrous along some leaf margins; leaves spatulate to almost linear, 4–28 mm long, 1–5 mm wide, obtuse to acute, mucronulate, thick, sessile; heads subglobose, 6–10 mm high; involucre 4–6 mm high. Blackbrush, indigobush, and creosote bush communities at 850 to 1375 m in Kane, San Juan, and Washington counties; Arizona, Nevada, and California; 22 (iv).

ACHILLEA L.

Perennial, rhizomatous, aromatic herbs, with watery juice; stems erect or ascending; leaves alternate, 1- to 3-pinnately dissected; leaves several to many, borne in compact to open corymbose cymes; involucre bracts imbricate in several series, chaffy, the margins scarious and hyaline; receptacle chaffy; ray flowers present, usually 3–12, pistillate, fertile, yellow, white, pink, or pink-purple; disk flowers mostly 10 or more, perfect, fertile; pappus none; style branches flattened; achenes compressed, callus margined, glabrous, beakless.

- 1. Flowers yellow; leaves coarsely twice pinnately dissected; plants cultivated ..... *A. filipendulina*
- Flowers white, pink, or pink-purple; leaves finely 2–3 times dissected; plants indigenous or cultivated ..... *A. millefolium*

*Achillea filipendulina* Lam. Fernleaf Yarrow. Herbs, the stems erect, 8–12 dm tall or more, longitudinally furrowed and minutely glandular; leaves 4–35 cm long, doubly pinnatifid, the lateral lobes with one large lobe on the upper side; heads numerous, borne in hemispheric or flat-topped corymbose cymes; involucre 3–4 mm high, the bracts with pale scarious margins, villous; rays about 5, to 1 mm long, yellow; disk flowers 30–40, yellow; achenes 1–2 mm long. Cultivated ornamental, Salt Lake and Utah counties, and to be expected elsewhere; introduced from Asia; 2 (0).

*Achillea millefolium* L. Milfoil Yarrow. Herbs, the rhizomes horizontal; stems ascending to erect, 0.5–10 dm tall, villous-tomentose, simple or branched above; leaves 2–26 cm long, reduced upwards, pinnately once to thrice dissected, the segments very slender; heads numerous, borne in hemispheric or flat-topped, corymbose cymes; involucre 4–6 mm high, the bracts dark to pale margined, villous to glabrate; rays usually about 5, 2–3.5 mm long, white to pink or pink-purple; disk flowers 10–20; achenes 1–2 mm long. Gravelly, sandy, and clayey soils in sagebrush, pinyon-juniper, cottonwood, juniper, rabbitbrush, ponderosa pine, mountain brush, aspen, Douglas fir, spruce-fir, and al-

pine tundra communities at 1070 to 3750 m in all Utah counties; widely distributed in North America; circumboreal. Two very similar taxa are present in Utah; the common, indigenous ssp. *lanulosum* (Nutt.) Piper (n=18), and the introduced, cultivated, ssp. *millefolium* (n=27). A trend is recognizable within ssp. *lanulosum*; the high elevation specimens tend to have dark involucre bracts, fewer heads, and lower stature. These alpine plants have been treated as var. *alpicola* (Rydb.) Garrett, but they intergrade completely with specimens attributable to var. *lanulosa*. Indeed, the two extremes can be found mounted on the same herbarium sheet, taken from the same locality; 133 (xv).

AGOSERIS Raf.

Perennial scapose herbs with milky juice, from taproots; leaves all basal, entire to pinnately lobed or merely toothed; heads solitary on a naked scape; involucre bracts in 2 to several series, herbaceous, or the inner ones hyaline or nearly so; receptacle usually naked; corollas all raylike, perfect, yellow to orange, often drying pinkish or purplish; pappus of capillary bristles; style branches semicylindric; achenes angular or terete, prominently nerved, usually beaked.

1. Plants annual; achene beak 2–3 times as long as the body; rare in Utah ..... *A. heterophylla*
- Plants perennial; achene beak less than half to 2 or more times as long as the body ..... 2
- 2(1). Achene beak striate, mostly less than half as long as the body (longer in some var. *laciniata*); flowers yellow, often drying bluish to pinkish ..... *A. glauca*
- Achene beaks scarcely striate, more than half to 2 or more times as long as the body ..... 3
- 3(2). Flowers brownish orange to yellow-orange, often drying purplish; achene beak less than twice as long as the body ..... *A. aurantiaca*
- Flowers yellow, often drying bluish or pinkish; achene beak more than twice as long as the body ..... *A. grandiflora*

***Agoseris aurantiaca* (Hook.) Greene** Orange Agoseris. Plants 0.6–6.6 dm tall, from a simple or branched caudex; leaves 3.5–36 cm long, 0.5–3 cm broad, narrowly oblanceolate, entire to toothed or lobed, villous to glabrate; scapes villous-tomentose to nearly glabrous; involucre 10–27 mm long, 10–42 mm wide, the outer bracts villous to glabrate and cil-

iate, often purple spotted; corollas brownish orange to yellow-orange, often drying purplish; achene body 4–8 mm long, the slender beak not striate, from more than half as long to longer than the body. Two rather weak and intergrading phases are recognized at varietal rank.

1. Involucres with bracts subequal or nearly so, slender, tapering, some often over 20 mm long ..... *A. aurantiaca* var. *aurantiaca*
- Involucres with bracts definitely imbricate, broad, and rounded apically or abruptly tapering ..... *A. aurantiaca* var. *purpurea*

**Var. *aurantiaca*** [*Troximon aurantiacum* Hook.; *A. arizonica* Greene; *A. gracilens* (Gray) Kuntze; *A. longirostris* Greene, type from Fish Lake]. Sagebrush, mountain brush, juniper, pinyon-juniper, and alpine meadow communities at 1375 to 3355 m in Beaver, Box Elder, Carbon, Duchesne, Juab, Salt Lake, San Juan, Sevier, Tooele, Uintah, Utah, and Wasatch counties; Alberta to British Columbia, south to California and New Mexico; 33 (v).

**Var. *purpurea*** (Gray) Cronq. [*Troximon aurantiacum* var. *purpureum* Gray; *A. purpurea* (Gray) Greene; *A. confinis* Greene, type from near Marysville]. Mountain brush, aspen, aspen-fir, and spruce-fir communities at 1700 to 3425 m in Carbon, Emery, Grand, Juab, Iron, Piute, Sanpete, Sevier, and

Wasatch counties; Montana to Arizona and New Mexico; 20 (vi).

***Agoseris glauca* (Pursh) Raf.** Pale Agoseris; Mountain Dandelion. Plants perennial, 0.2–6.4 dm tall, from a simple or branched caudex; leaves 2–26 cm long, 0.2–3 cm broad, narrowly oblanceolate to linear or spatulate to elliptic, entire or toothed to lobed, villous to glabrate; involucre 12–28 mm high, 0.8–4 cm wide, the outer bracts villous to glabrous, ciliate or not, sometimes purple spotted; corollas yellow, often drying bluish to pinkish; achene body 4–10 mm long, the striate beak stout, to half as long as the body (slender and to as long as the body in some var. *laciniata*). Three intergrading and partially sympatric varieties are present in Utah.

1. Leaves laciniately toothed or lobed; plants of broad distribution, common ..... *A. glauca* var. *laciniata*

- Leaves entire, rarely with a few teeth or lobes; plants variously distributed, locally common ..... 2
- 2(1). Plants pubescent, at least below the heads; mainly of spruce-fir and alpine communities, sometimes lower ..... *A. glauca* var. *dasycephala*
- Plants glabrous throughout, mainly of lower elevation wet meadows, but sometimes of high elevation meadows ..... *A. glauca* var. *glauca*

**Var. *dasycephala* (T. & G.) Jeps.** [*Amogeton scorzoneraefolius* Shrad.; *A. scorzoneraefolia* (Shrad.) Greene; *Troximon pumilum* Nutt.; *A. pumila* (Nutt.) Rydb.; *A. glauca* var. *pumila* (Nutt.) Garrett; *T. glaucum* var. *dasycephalum* T. & G.; *A. villosa* Rydb.]. Sagebrush, mountain brush, aspen, spruce-fir, and alpine tundra communities at 1830 to 3385 m in Duchesne, Garfield, Iron, Kane, Piute, Salt Lake, San Juan, Sanpete, Sevier, Tooele, Uintah, and Utah counties; Alaska to Manitoba and south to Colorado. Plants of this variety pass by degree into each of the following; 29 (v).

**Var. *glauca* [Troximon glaucum Pursh; A. isomeris Greene,** type from the Uinta Mountains]. Meadows at 2325 to 3660 m in Box Elder, Duchesne, Iron, Juab, Sanpete, Sevier, Summit, Uintah, and Wasatch counties; British Columbia to Manitoba and south to California and Arizona; 22 (iv).

**Var. *laciniata* (D.C. Eaton) Smiley [Troximon parviflorum Nutt.; A. parviflora (Nutt.) D. Dietr.; A. glauca var. parviflora (Nutt.) Rydb.; T. taracifolium Nutt.; A. taracifolia (Nutt.) D. Dietr.; Macrorhynchus glaucus var. laciniatus D.C. Eaton; A. taraxacoides Greene,** type from near Marysville; *A. caudata* Greene, type from Salina Canyon; *A. agrestis* Osterh.; *A. glauca* var. *agrestis* (Osterh.) Q. Jones]. Sagebrush, mountain brush, juniper, pinyon-juniper, Douglas fir, aspen, and spruce-fir communities at 1300 to 3050 m in Beaver, Box Elder, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Juab, Kane, Millard, Piute, San Juan, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Washington, Wayne, and Weber counties; Washington to Montana and south to Arizona. The phase designated as var. *agrestis* blends completely in our area with that treated herein as var. *laciniata*; 84 (xii).

**Agoseris grandiflora (Nutt.) Greene** [*Stylopappus grandiflorus* Nutt.]. Plants perennial, 1.5–4.5 (7) dm tall, from a simple or branching caudex; leaves 8–25 cm long, 1–3 cm broad, narrowly oblanceolate, pinnatifid to subentire, villous to glabrate; involucre 15–38 mm long, 20–43 mm wide, the outer bracts villous-tomentose to glabrate, ciliate, often suffused with purple; corolla yellow, drying bluish to pinkish; achene body 4–7 mm long, the nerveless beak more than twice as long as the body. Specimens tentatively assigned to this species are from Cache, Iron, Tooele, and Washington counties, where they occur in sagebrush and mountain brush communities at 1830 to 2135 m; British Columbia to California and Nevada; 4 (i).

**Agoseris heterophylla (Nutt.) Greene** Annual Agoseris. [*Macrorhynchus heterophyllus* Nutt.]. Plants annual, 0.3–2.5 (4) dm tall, with 1 to several scapes from the base; leaves 1–20 (15) cm long, 0.3–1.5 cm wide, narrowly oblanceolate, toothed or pinnatifid to entire, all basal, or with some not strictly basal; involucre 5–20 mm long, 4–10 mm wide, sparingly villous with multicellular hairs, the cross-walls purplish; corolla yellow, sometimes turning pinkish on drying; achene body 2–5 mm long, prominently ribbed or winged, the beak 2–3 times as long as the body. Our one collection (Diehl D29, 1899 BRY) is from Salt Lake County at low elevation; British Columbia to California and Arizona; 1 (0).

#### AMBROSIA L

Annual or perennial herbs or shrubs; leaves alternate or opposite, pinnately or palmately lobed, toothed, or dissected; heads unisexual, discoid; staminate heads in slender spicate, bractless racemes; involucre 5- to 12-lobed;



receptacle flat, bearing flattened filiform-setose bracts; staminal filaments monadelphous, the anthers scarcely united; pistillate heads borne below the fertile ones, mostly axillary, their involucre closed, nutlike, armed with

prickles arranged in one or more series; pistil naked, the corolla lacking; pappus lacking.  
PAYNE, W. W. 1964. A reevaluation of the genus *Ambrosia*. J. Arnold Arboretum 45:401-438.

- 1. Plants woody shrubs of southwestern Utah ..... 2
- Plants annual or perennial herbs, of various distribution ..... 3
- 2(1). Leaves mainly less than 15 mm long, pinnately lobed, the lobes again toothed or lobed, silvery-strigose overall ..... *A. dumosa*
- Leaves mainly more than 20 mm long, merely toothed or lobed, the lobes not again toothed or lobed, bicolored, the upper surface green, the lower surface white-tomentose ..... *A. eriocentra*
- 3(1). Leaves palmately lobed, the lobes serrate; plants tall coarse herbs ..... *A. trifida*
- Leaves pinnatifid or pinnately lobed; plants slender herbs usually less than 5 dm tall ..... 4
- 4(3). Leaves bicolored, the lower surface obscured by appressed white hairs; plants low rhizomatous perennials ..... *A. tomentosa*
- Leaves various, but not definitely bicolored; plants from taproots or rhizomes, but, if the latter, not as above ..... 5
- 5(4). Plants perennial, rhizomatous; leaves opposite ..... *A. psilostachya*
- Plants annual; leaves mainly alternate ..... 6
- 6(5). Lower stems and leaves with pustular-based, stiff, multicellular hairs; plants often with lower lateral branches decumbent-ascending; burs with spines in more than one series ..... *A. acanthicarpa*
- Lower stems lacking pustular-based hairs, all stems slender and curved ascending-appressed; burs with spines in one series ..... *A. artemisiifolia*

*Ambrosia acanthicarpa* Hook. Bur Ragweed. [*Franseria acanthicarpa* (Hook.) Coville]. Plants annual, 0.9-7.5 dm tall, often branching from the base, the lower branches commonly decumbent-ascending; pubescence of stiff multicellular hairs, the bases pustular; leaves mostly alternate, petiolate, the blades 0.9-4.5 cm long, 0.6-3.5 cm wide, bipinnatifid to pinnatifid; heads numerous in terminal or axillary racemes; staminate above, pistillate below; staminate heads short-pedunculate, not bracteate; pistillate solitary or clustered in upper axils, with 2-3 series of flattened, curved spines. Blackbrush, salt desert shrub, desert shrub, pinion-juniper, and riparian communities, often in sandy substrates, at 850 to 2000 m, in Beaver, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane, Millard, San Juan, Tooele, Uintah, Utah, Washington, and Wayne counties; Washington to Saskatchewan, south to California, Arizona, and Texas; 60 (xi).

*Ambrosia artemisiifolia* L. Common Ragweed. [*A. elatior* L.]. Plants annual, mostly 3-9 dm tall, branching from above the middle; pubescence of lax multicellular hairs, the bases not pustular; leaves alternate, or the lower usually opposite, petiolate, the blades 2.5-8.5 cm long, 1.9-7.5 cm wide, 1- to 2-pinnatifid; heads numerous in terminal or axillary racemes, the staminate above, pistillate below, clustered or solitary, with 1 series of tuberculate spines. Moist disturbed sites at 1375 to 1500 m in Juab and Utah counties; widespread in North America; 11 (i).

*Ambrosia dumosa* (Gray) Payne Bur-sage. [*Franseria dumosa* Gray]. Shrubs, 2-6 dm tall, rounded, much branched; branchlets white, subspinescent; pubescence dense, strigose; leaves alternate, petiolate, the blades 9-30 mm long, 5-15 mm wide, mostly 2-pinnatifid, uniformly hairy on both sides; staminate heads spicate, rather few; pistillate



heads often scattered among the staminate; pistillate involucre maturing 20–35 lance-subulate spines. Creosote bush, blackbrush, and Joshua tree communities at 670 to 1000 m in Washington County; Arizona, California, and Mexico; 28 (i).

*Ambrosia eriocentra* (Gray) Payne [*Franseria eriocentra* Gray]. Shrubs, 3–10 (12) dm tall, aromatic, branchlets white, subspinescent, pubescence of white tomentum and coarse multicellular hairs; leaves alternate, subsessile, sinuately toothed to lobed or 1-pinnatifid, 8–40 (50) mm long, 2–20 mm wide; staminate heads more or less clustered; pistillate heads 1-flowered; pistillate involucre with 12–20 flattened, subulate spines. Creosote bush, blackbrush, and Joshua tree communities at 670 to 1000 m in Washington County; Arizona, Nevada, and California; 12 (ii).

*Ambrosia psilostachya* DC. Western Ragweed. [*A. coronopifolia* T. & G.]. Perennial herbs, mostly 3–6 dm tall, simple or branching above the middle; pubescence of harsh, spreading, multicellular, pustular-based hairs (at least in part); leaves opposite, at least below, petiolate to subsessile, the blades 4–10 cm long, 2.5–4.5 cm wide, mostly once pinnatifid; staminate heads in terminal or axillary spicate racemes; pistillate involucre merely tuberculate or quite unarmed. Meadows, stream banks, and roadsides in sagebrush and other communities at 1300 to 2100 m in Davis, Juab, Millard, Salt Lake, Utah, and Weber counties; Washington to Illinois, south to Arizona and Mexico; 20 (ii).

*Ambrosia tomentosa* Nutt. [*Franseria discolor* Nutt.; *F. tomentosa* (Nutt.) A. Nels., not *A. tomentosa* Gray]. Perennial rhizomatous herbs, mostly 1–3.5 dm tall, branching from above the base; pubescence of short, stiff, appressed hairs; leaves alternate, petiolate, the blades 2–15 cm long, 0.4–3.5 cm wide, 1- to 3-pinnatifid; staminate heads racemose; pistillate heads armed with 2 or 3 series of coarse spines. Meadows and stream banks at 1300 to 1525 m in Davis, Duchesne, and Grand counties (likely elsewhere); Wyoming and Colorado; 5 (iii).

*Ambrosia trifida* L. Giant Ragweed. Annual, robust herbs, 10–15 dm tall or more; pubescence spreading-hirsute to hispid, at least above; leaves opposite, petiolate, the

blades palmately 3- to 5-lobed, or unlobed, mainly 5–20 cm long, 4–15 cm wide, scabrous on both surfaces, serrate; staminate involucre 3-nerved; pistillate involucre 5–10 mm long, bearing short spines at the tip. Uncommon (introduced?) weedy plants of disturbed sites in Salt Lake County (likely elsewhere); widely distributed in North America; 1 (0).

#### AMPHIPAPPUS T. & G.

Low shrubs; branches white-barked, divaricate; leaves alternate, entire, short-petiolate; heads small, radiate, few flowered, clustered at tips of branches; involucre in ca 3 series, strongly imbricate, straw colored to greenish, the bracts broad, rounded; receptacle fimbriate; ray flowers yellow, 1 or 2, small; disk flowers 3–6, perfect; ray achenes hairy, broadly oblanceolate, compressed, their pappus of more or less united bristles, awns, or scales; disk achenes undeveloped, glabrous or sparingly pilose, their pappus of twisted, hispidulous bristles or scales.

PORTER, C. L. 1943. The genus *Amphipappus* Torr. & Gray. *Amer. J. Bot.* 30: 481–483.

*Amphipappus fremontii* T. & G. Chaff-bush. Shrubs 3–8 dm tall, the herbage scabrous-puberulent; leaves 5–12 mm long, 2–5 mm wide, oblanceolate to elliptic, cuneate basally, acute to obtuse and apiculate, green; heads 4–6 mm high, the bracts greenish medially near the apex, the margins hyaline and more or less erose. Joshua tree and creosote bush communities at 700 to 900 m in Washington County; Nevada, Arizona, and California. Our material belongs to var. *spinosus* (A. Nels.) C. L. Porter [ssp. *spinusus* (A. Nels.) Keck]; 4 (i).

#### ANAPHALIS DC.

Perennial, dioecious or polygamodioecious, rhizomatous herbs, with watery juice; stems ascending to erect, simple or branched above; leaves simple, alternate, entire; heads several to many, in hemispheric or flat-topped corymbose cymes; involucre bracts imbricate in several rows, chaffy, scarious, white, or with a dark triangular basal spot; receptacle naked; corollas of disk flowers only, imperfect, whitish, the pistillate

heads sometimes bearing some central staminate flowers, the pistillate corollas tubular-filiform, the staminate corollas tubular-funnelform; pappus of capillary bristles; style branches somewhat flattened; achenes small, roughened, glabrous to sparingly hairy.

*Anaphalis margaritacea* (L.) Benth. & Hook. Pearly Everlasting. [*Gnaphalium margaritaceum* L.]. Plants 1.5–8 dm tall, the stems white villous-tomentose; leaves only gradually reduced upwards, 2.5–12 cm long, 0.5–2 cm wide, narrowly lanceolate to oblong, elliptic, or oblanceolate, sessile, entire, flat to slightly revolute, white-tomentose below, commonly less pubescent and greenish above; heads showy, the involucre 4–7 mm high, 5–10 mm broad, the bracts pearly-white, with a dark triangular base, glabrous; achenes about 1 mm long. Meadows, stream-banks, and openings in ponderosa pine, lodgepole pine, box elder, and aspen communities at 1150 to 2700 m in Box Elder, Du-

chesne, Iron, Juab, Salt Lake, Summit, Wasatch, and Washington counties; widely distributed in North America; Asia; 33 (vi).

# ANTENNARIA Gaertn.

Perennial, dioecious herbs with stolons, caudices, or rhizomes, the juice watery; stems ascending to erect, usually simple; leaves simple, alternate and basal, the cauline generally reduced upward; heads solitary to many, borne in corymbose cymes; involucre bracts imbricate in several rows, scarious (at least marginally), often colored; receptacle naked; corollas of disk flowers only, imperfect, whitish or tawny; pistillate corollas tubular-filiform, the pappus of numerous capillary bristles; staminate corollas tubular-funnelform, the pappus of few clavate to barbellate, usually flattened bristles; style branches slightly flattened; achenes terete to slightly compressed, glabrous or papillose.

1. Heads solitary; flowering stems usually less than 5 cm tall ..... *A. dimorpha*  
— Heads (1) 2 to many (see *A. rosulata*); flowering stems often more than 5 cm tall ..... 2
- 2(1). Upper leaf surface green; leaf blades broadly spatulate, rounded to obtuse ..... *A. neglecta*  
— Upper leaf surface not notably different from the lower; blades seldom both spatulate and rounded to obtuse ..... 3
- 3(2). Plants not forming mats, lacking leafy stolons, some caespitose from caudex or rhizomes ..... 4  
— Plants mat forming, with leafy stolons ..... 6
- 4(3). Involucre bracts glabrous or nearly so, scarious near the base, white-opaque apically ..... *A. luzuloides*  
— Involucre bracts densely tomentose in the lower half, opaque to dark with pale scarious apices ..... 5
- 5(4). Involucre bracts blackish in aspect, the tips pale and scarious ..... *A. pulcherrima*  
— Involucre bracts opaque white, somewhat darkened at the middle .. *A. anaphaloides*
- 6(3). Terminal scarious portion of involucre bracts dirty brownish to blackish green on at least the middle and outer ones ..... 7  
— Terminal scarious portion of involucre bracts white to pink, with a dark basal spot on some only ..... 8
- 7(6). Terminal scarious portion of involucre bracts blackish green; plants usually alpine in Uinta, Wasatch, and Tushar Mountains, and on the Markagunt Plateau ..... *A. alpina*  
— Terminal scarious portion of bracts merely discolored and pale brown, or the inner bracts whitish at the tips; plants usually of lower elevations ..... *A. umbrinella*
- 8(6). Flowering stems less than 5 cm tall; heads 1 or 2; plants of Garfield, Kane, and Wayne counties ..... *A. rosulata*

- Flowering stems commonly more than 5 cm tall; heads usually 3 or more; plants of broad, or other, distribution ..... 9
- 9(8). Involucral bracts with a black spot between the tomentose greenish base and the opaque white-scarious apex ..... *A. corymbosa*
- Involucral bracts lacking a conspicuous black spot ..... 10
- 10(9). Involucres mostly 4–7 mm high, often bright pink; pistillate corollas mostly 2–4.5 mm long ..... *A. microphylla*
- Involucres mostly 7–11 mm high, seldom pink; pistillate corollas mostly 5–8 mm long ..... *A. parvifolia*

*Antennaria alpina* (L.) Gaertn. Alpine Pussytoes. Plants caespitose from a caudex, mat forming and stoloniferous, 2–13 cm tall; basal leaves 0.6–2.2 cm long, 2–6 mm wide, cuneate-ob lanceolate to spatulate, acute to obtuse or rounded apically, grayish tomentose on both surfaces or greenish and subglabrous above on some leaves; heads 3–5, borne in subcapitate cymes; pistillate involucres 5–7 mm high, villous-tomentose below, the scarious tips of bracts uniformly blackish or brownish green, all rather blunt apically, often erose; staminate involucres mostly 4–5 mm high, the scarious tips of bracts often pale apically; achenes glabrous. Lodgepole pine, spruce-fir, and alpine tundra communities at 3050 to 3550 m in Daggett, Duchesne, Piute, Salt Lake, Uintah, and Utah counties; north to Alaska and east to Labrador; circumboreal. Our material belongs to var. *media* (Greene) Jeps. [*A. media* Greene; *A. austromontana* E. Nels., type from Tushar Mountains]. There is a tendency for some specimens to approach *A. parvifolia* in the Uinta Mountains and *A. umbrinella* elsewhere; 27 (vii).

*Antennaria anaphaloides* Rydb. Pearly Pussytoes. Plants from a caudex, not mat forming or stoloniferous, 1.5–3.5 (5) dm tall; basal leaves 2.5–19 cm long, 4–18 mm wide, narrowly oblanceolate to elliptic, tomentose on both surfaces; heads several to many in branching or compact cymes; pistillate involucres 5–8 mm high, villous-tomentose below, the scarious tips opaque-white, all rounded or obtuse, often erose; staminate involucres 5–8 mm high, similar to the pistillate; achenes glabrous. Aspen, spruce-fir, sagebrush, and mountain brush communities at 2440 to 3325 m in Daggett, Summit, and Uintah counties; British Columbia to Montana and south to Nevada and Colorado; 7 (i).

*Antennaria corymbosa* E. Nels. Plains Pussytoes. [*A. nardina* Greene]. Plants caespitose, mat forming and stoloniferous, 5–26 cm tall; basal leaves 0.6–3.7 cm long, 2–6 mm wide, narrowly oblanceolate to spatulate, acute to obtuse apically, gray to greenish and tomentose on both surfaces; heads commonly 3–8, in compact to branching cymes; pistillate and staminate involucres 4.5–6 mm high, the bracts green and tomentose basally, with a dark spot at the base of the white or sordid terminal portion; achenes puberulent. Alpine tundra, krumholz, spruce-fir, lodgepole pine, and willow-alder communities, often along stream banks and in wet meadows or bogs, at 2240 to 3355 m in Beaver, Duchesne, Garfield, Summit, and Uintah counties; Montana and Idaho to Colorado and California(?). The main body of the species in Utah lies in the Uinta Mountains, with outliers in the Stansbury and Tushar mountains, and in the Markagunt Plateau; 22 (iii).

*Antennaria dimorpha* (Nutt.) T. & G. Low Pussytoes. [*Gnaphalium dimorphum* Nutt.; *A. dimorpha* var. *macrocephala* D.C. Eaton, type from Salt Lake City]. Plants caespitose, mat forming, rooting from short caudex branches, not truly stoloniferous, 1–5 (7) cm tall; basal leaves narrowly oblanceolate, 0.6–4 cm long, 1–14 mm wide, acute apically, grayish tomentose on both sides; heads solitary, terminal on short leafy stems; pistillate involucres (7) 10–18 mm long, the bracts strongly imbricated, slender, attenuate, green at base, suffused with brown above the base, the apical portions yellowish to brownish scarious; staminate involucres 6–9 mm long, tomentose at the base, brown above the base, the broad apical portion hyaline to scarious; achenes puberulent. Mat-saltbush, sagebrush, juniper, oak-serviceberry, ponderosa pine, and spruce-fir-lodgepole pine communities at



1430 to 3050 m in Beaver, Daggett, Duchesne, Iron, Juab, Millard, Salt Lake, Sanpete, Sevier, Summit, Tooele, Utah, and Washington counties (and certainly elsewhere); British Columbia to Montana, south to California, Nevada, Colorado, and Nebraska; 37 (viii).

*Antennaria luzuloides* T. & G. Rush Pussytoes. [*A. ob lanceolata* Rydb.]. Caespitose from a caudex, 1.1–5 (7) dm tall; basal leaves 2–5 (8) cm long, 2–8 mm wide, greenish, tomentose on both surfaces; heads numerous in a compact or more often branched corymbose inflorescence; pistillate and staminate involucre similar, 4–5 mm high, glabrous to the base, the bracts brownish scarious and more or less hyaline below, opaque whitish above; achenes puberulent. Openings in aspen-conifer and lodgepole pine-spruce communities at 2950 to 3050 m in Duchesne and Summit counties; British Columbia to Montana, south to California, Nevada, and Colorado; 7 (i).

*Antennaria microphylla* Rydb. Rosy Pussytoes. [*A. rosea* Rydb.; *A. concinna* E. Nels.; *A. arida* A. Nels.]. Plants caespitose, stoloniferous and mat forming, 0.4–3 (4) dm tall; basal leaves 0.5–3 cm long, 2–8 mm wide, oblanceolate to spatulate; heads 2–13 (or more), in congested to open cymes; pistillate involucre 4–7 mm high, the bracts tomentose below, greenish or scarious below the middle, often somewhat brownish below the scarious, whitish or pinkish, terminal portion; mainly known from pistillate individuals; achenes glabrous or sparingly hispidulous. Sagebrush, juniper, ponderosa pine, Douglas fir, lodgepole pine, spruce-fir, and alpine meadow communities at 1830 to 3450 m in Beaver, Box Elder, Carbon, Daggett, Duchesne, Emery, Garfield, Iron, Juab, Kane, Millard, Piute, Rich, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, Wayne, and Weber counties; Alaska to Ontario, south to California and New Mexico; 105 (xxiii).

*Antennaria neglecta* Greene Field Pussytoes. [*A. marginata* Greene]. Plants caespitose, stoloniferous and mat forming, 5–15 (25) cm tall; basal leaves 1.8–3.5 cm long, 3–15 mm wide, spatulate, thinly tomentose to glabrous and green above, white-tomentose beneath; heads mainly 3–5, in compact

cymes; pistillate involucre 6–11 mm high, the bracts tomentose on the greenish base, the apical scarious portion white or suffused with pink; staminate plants rare; achenes glabrous or minutely pubescent. Pinyon-juniper and shrub communities at 1525 to 1900 m in San Juan, Utah, and Washington counties; Alaska to Newfoundland, south to California, Arizona, and Virginia; 3 (i). Our few specimens are hardly adequate to represent this species clearly in Utah.

*Antennaria parvifolia* Nutt. [*A. aprica* Greene; *A. obtusita* Greene]. Plants caespitose, stoloniferous and mat forming, 3–15 cm tall; basal leaves 0.8–3.5 cm long, 3–8 mm wide, spatulate, obtuse to acute apically, tomentose on both sides; heads 2–6 or more; pistillate involucre 7–11 mm high, the bracts more or less tomentose on the greenish base, the scarious portion white, sordid, or pink; staminate plants rarely collected; achenes glabrous. Mountain brush, pinyon-juniper, sagebrush, ponderosa pine, aspen, lodgepole, and spruce-fir communities at 1650 to 3250 m in Beaver, Carbon, Daggett, Duchesne, Emery, Garfield, Juab, Kane, Piute, San Juan, Summit, Tooele, Uintah, Utah, and Wayne counties; British Columbia to Manitoba, south to Arizona and New Mexico; 46 (iv).

*Antennaria pulcherrima* (Hook.) Greene Showy Pussytoes. [*A. carpathica* var. *pulcherrima* Hook.]. Plants from a caudex, not mat forming or stoloniferous, 23–40 cm tall; basal leaves 4–19 cm long, 5–23 mm wide, narrowly to broadly oblanceolate to elliptic, tomentose on both surfaces; heads several to many in branching or compact cymes; pistillate and staminate involucre both 6.5–8 mm long, the bracts tomentose at the greenish base, the terminal scarious portion blackish to brownish or the apex whitish; achenes glabrous. Sedge-rush meadows, streamsides, and bogs at 2440 to 2800 m in Duchesne, Garfield, and Summit counties; Alaska to Newfoundland, south to Colorado; 5 (i).

*Antennaria rosulata* Rydb. Plants caespitose, stoloniferous and mat forming, 1–3 cm tall; basal leaves 0.5–1.1 cm long, 2–5 mm broad, spatulate, obtuse to rounded apically, tomentose on both surfaces; heads 1 or 2, terminating short erect branches; pistillate involucre 5–9 mm high, the outer bracts



greenish and tomentose to the apex, the inner ones green at base, with scarious slender white tips; staminate involucre 4–5 mm high, the bracts densely tomentose at base, the broad scarious tips white-opaque; achenes puberulent. Ponderosa pine, aspen, Douglas fir, limber pine, sagebrush, and spruce communities, and in alpine meadows, at 2600 to 3350 m in Garfield, Kane, and Wayne counties; Colorado, New Mexico, and Arizona; 14 (i).

*Antennaria umbrinella* Rydb. [*A. dioica* authors, not (L.) Gaertn.]. Plants caespitose, mat forming and stoloniferous, 2–14 mm tall; basal leaves 0.7–2 cm long, 0.2–1.5 cm wide, cuneate-oblongate to spatulate, acute to obtuse apically, tomentose on both sides; heads 2–6, borne in subcapitate cymes; pistillate involucre 5–8 mm long, the bracts greenish and tomentose at the base, the scarious tips dirty brownish to pale tan, or the innermost almost white, acute to rounded, usually erose; staminate plants unknown in our region; achenes glabrous. Aspen communities and alpine meadows at

2745 to 3500 m in Duchesne, Juab, and Summit counties; Alaska to Hudson Bay, south to California, Arizona, and Colorado; 4 (0). Specimens assigned here are more or less intermediate between *A. alpina* and *A. microphylla*. Many more specimens are required to provide definitive information on this entity in Utah.

#### ANTHEMIS L.

Annual or short-lived perennial, aromatic herbs from taproots, the juice watery; stems erect, commonly branched; leaves alternate, 1–3 pinnately dissected; heads solitary on the uppermost branches; involucre bracts imbricated in several series, chaffy, the margins scarious or hyaline; receptacle hemispheric, chaffy at least near the middle; ray flowers present, white or yellow, usually 10 or more, sterile; disk flowers numerous, perfect, fertile; pappus none or a short crown; style branches flattened; achenes subterete or compressed, not callous-margined, glabrous, beakless.

1. Rays white; pappus lacking; disk commonly less than 10 mm broad ..... *A. cotula*
- Rays yellow; pappus a short crown; disk commonly more than 12 mm broad  
..... *A. tinctoria*

*Anthemis cotula* L. Mayweed. Plants annual, 1–7.5 dm tall; stems simple or branched, ill scented; leaves 1–6 cm long, twice pinnatifid, the ultimate segments lance-oblong, sparsely villous and glandular-dotted; heads borne solitary at the upper ends of the uppermost branches; ray flowers commonly 10–20, white, sterile, 5–10 mm long; disk flowers numerous; disk 4–10 (12) mm wide; receptacle chaffy only in the middle, the bracts narrowly subulate; achenes slightly flattened, glandular, the pappus lacking. Introduced Old World weeds of fields, roadsides, revegetated woodlands, and other disturbed sites at 1280 to 1400 m in Duchesne, Morgan, Salt Lake, Utah, and Weber counties (likely elsewhere); widespread in North America; 7 (0).

*Anthemis tinctoria* L. Yellow Camomile. Plants short-lived perennials, 2.5–6 dm tall; stems simple or branched; leaves 1.5–7 cm long, 1- to 2-pinnatifid, the segments oblong

in outline, merely toothed or lobed, villous-tomentose below, glabrous or glabrate above, sparsely glandular-dotted; heads borne solitary at ends of the uppermost branches; ray flowers 20–35, yellow, fertile, 7–14 mm long; disk flowers numerous; disk 12–15 mm wide or more; receptacle chaffy throughout, the bracts narrow and with yellow awn-tips; achenes compressed; pappus a short crown. Old World cultivated ornamentals; widely planted and occasionally escaping (Salt Lake County, Garrett 8865 BRY); widespread in North America; 1 (0).

#### ARCTIUM L.

Biennial, coarse herbs with watery juice, from a taproot; leaves rhubarblike, basal and alternate, entire or toothed; heads few to numerous in axillary or terminal corymbose or racemose inflorescences; flowers all tubular, perfect, the corollas pink to purplish; in-

volucres urn shaped, the bracts imbricate in many series, the tips slender and inwardly hooked; receptacle flat, densely bristly; achenes slightly compressed, more or less 3-angled, many nerved, truncate apically; pappus of numerous, scaly, deciduous bristles.

1. Heads mainly 1.5–2.5 cm thick, arranged in racemelike axillary clusters, the terminal also racemelike ..... *A. minus*
- Heads commonly over 2.5 cm thick, arranged in corymbose clusters, especially the terminal ..... *A. lappa*

*Arctium lappa* L. Great Burdock. Plants 8–15 dm tall; basal leaves long-petiolate, the blades commonly 2–5 dm long, 1–3 dm broad, cordate-ovate, obtuse, thinly tomentose beneath, glabrous or nearly so above; inflorescence corymbosely disposed, the peduncles glandular or glandular-hairy; heads 2.5–4 cm broad, the involucre greenish stramineous, glabrous or glandular, often sparingly arachnoid-tomentose. Cultivated for its edible roots, and persisting; introduced from Eurasia; 1 (0).

*Arctium minus* (Hill) Bernh. Burdock. Plants 5–15 dm tall; basal leaves long-petiolate, the blades commonly 1–3.5 (4) dm long, 1–3 dm wide, cordate-ovate, obtuse, thinly tomentose to glabrous beneath, glabrous above or nearly so; inflorescence racemosely disposed, the peduncles short or lacking; heads 1–2.5 cm thick (rarely more), the bracts glabrous or glandular to definitely arachnoid. Introduced Old World weed of consequence in Cache, Juab, Millard, Piute,

Sevier, Summit, Tooele, Uintah, Utah, Wasatch, Wayne, and Weber counties, and probably cosmopolitan; widespread in North America; Eurasia; 23 (i).

ARNICA L.

Perennial herbs from rhizomes or caudices, the juice watery; stems erect, simple or branched above; leaves opposite or the uppermost alternate, simple, entire or toothed; heads solitary, or 3–9 (11) in corymbose clusters; involucre bracts subequal or evidently biseriate, herbaceous; receptacle naked, convex; ray flowers present, yellow or orange, several to many, fertile, or lacking (in *A. parryi*); disk flowers numerous, perfect, fertile; pappus of barbellate or subplumose capillary bristles; style branches flattened; achenes cylindrical, 5- to 10-nerved, pubescent to glabrate or glabrous, often glandular.

MAGUIRE, B. 1943. A monograph of the genus *Arnica*. Brittonia 4:386–510.

1. Heads discoid (rarely some with rays), the lateral (lower) ones spreading or reflexed, the uppermost one erect ..... *A. parryi*
- Heads radiate, the lateral ones (if any) erect like the uppermost ..... 2
- 2(1). Cauline leaves (4) 5–9 pairs; pappus brownish; heads often 5 or more per main stem ..... 3
- Cauline leaves 1–4 (5) pairs; pappus white or brownish; heads mainly 1–4 per stem ..... 4
- 3(2). Involucral bracts merely acute to abruptly rounded (rarely acuminate), bearing an apical or subapical tuft of hairs ..... *A. chamissonis*
- Involucral bracts acuminate to attenuate, not especially more hairy at the apex ..... *A. longifolia*
- 4(2). Leaves (at least the lower) cordate, ovate, or broadly ovate-lanceolate, often cordate, truncate, or obtuse basally, seldom cuneate ..... 5
- Leaves narrowly lanceolate to lance-oblong or lanceolate, usually cuneate basally ..... 7
- 5(4). Pappus brownish, subplumose; main cauline leaves obtuse to subcuneate basally ..... *A. diversifolia*

—	Pappus white, merely barbellate; main cauline leaves usually cordate, truncate, or obtuse basally .....	6
6(5).	Blades of main cauline leaves much longer than the petiole, or sessile; achenes glabrous throughout, or at least near the base .....	<i>A. latifolia</i>
—	Blades of main cauline leaves subequal to or shorter than the petioles; achenes uniformly, though sometimes sparingly, hairy .....	<i>A. cordifolia</i>
7(4).	Pappus brownish, subplumose .....	<i>A. mollis</i>
—	Pappus usually white or tawny, merely barbellate .....	8
8(7).	Heads turbinate-campanulate, commonly with 7–10 rays; lower cauline leaves sessile or nearly so .....	<i>A. rydbergii</i>
—	Heads hemispheric, commonly with 10–20 rays; lower cauline leaves often petiolate .....	9
9(8).	Old leaf bases bearing dense brown wool in the axils; disk corollas both spreading hairy and stipitate-glandular .....	<i>A. fulgens</i>
—	Old leaf bases lacking axillary tufts of hair, or with white hair only; disk corollas merely stipitate-glandular .....	<i>A. sororia</i>

*Arnica chamissonis* Less. [*A. foliosa* Nutt.; *A. chamissonis* ssp. *foliosa* (Nutt.) Maguire; *A. foliosa* var. *incana* Gray]. Plants 1–6 (8) dm tall, the stems erect or ascending, simple or more commonly branched in the inflorescence, sparsely to densely villous with multicellular hairs and often glandular as well; basal leaves 3–11 (15) cm long, 3–16 (20) mm wide, lanceolate to oblong or oblanceolate, with 3–5 main veins, pilose to villous or tomentose, tapering to a slender petiole, entire to distinctly toothed, smaller than the cauline ones and often withered by flowering time; cauline leaves (4) 5–8 (9) pairs, lanceolate to lance-elliptic, the largest near the middle of stem or slightly below, the lower ones petiolate and with membranous connate-sheathing bases, the upper sessile, entire to distinctly toothed; heads (1) 3–9, the peduncle apex sparingly to densely villous with whitish hairs often intermixed with glands; involucre 9–15 mm high, the bracts lanceolate, obtuse, acute, or less commonly acuminate, sparsely to densely pilose, ciliate, the tips with a conspicuous tuft of whitish hairs; rays usually 10–16, yellow; achenes 4–6 mm long, hairy to glandular or glabrate; pappus brownish to straw colored, barbellate. Stream banks, gravel bars, and lake shores in aspen, willow, and spruce-fir communities at 2300 to 3350 m in Duchesne, Emery, Garfield, Iron, Kane, Salt Lake, Sanpete, Sevier, Summit, Tooele, Wasatch, Washington, and Wayne counties; Alaska to Hudson Bay,

south to California and New Mexico; 29 (v). Maguire (1943) treated all Utah material as ssp. *foliosa* (Nutt.) Maguire. Cronquist (Univ. Washington Publ. Biol. 17(5): 45–54. 1955) cited var. *incana* (Gray) Hulten [ssp. *incana* (Gray) Maguire] from Utah. Our specimens are only arbitrarily separable into two phases, differing mainly in degree of pubescence. The correct name at varietal level for our gray hairy plants appears to be *A. chamissonis* var. *andina* (Nutt.) Ediger & Barkley.

*Arnica cordifolia* Hook. Plants 1.5–4 dm tall, the stems erect or ascending, simple or branched above, sparsely villous with multicellular hairs and often glandular as well; basal leaves smaller than the cauline, often withered at anthesis; petioles of main leaves (at least) often longer than the blades; cauline leaves 2–4 (5) pairs, the blades 2–9 cm long (from sinus to apex), 1–9 cm wide, cordate-ovate to orbicular or reniform, or the uppermost lanceolate, the largest below the middle of the stem, the lower leaves petiolate, the upper ones sessile or subsessile, serrate-dentate to subentire; heads 1 (3), rarely more, the peduncle apex villous with whitish hairs often intermixed with glands; involucre 14–20 mm high, the bracts lanceolate to oblong, acuminate to acute, sparsely to densely pilose and often glandular-ciliate, the tip with a moderate tuft of hair; rays usually 10–15, yellow; achenes 4–5.5 mm long, uniformly hairy and often glandular; pappus



white, barbellate. Sagebrush, Douglas fir, white fir, lodgepole pine, ponderosa pine, aspen, and spruce-fir communities at 1525 to 3355 m in Beaver, Box Elder, Cache, Carbon, Daggett, Duchesne, Garfield, Iron, Juab, Piute, Salt Lake, San Juan, Sanpete, Sevier, Summit, Uintah, Utah, Wasatch, Washington, Wayne, and Weber counties (likely universal); Alaska to Michigan, south to California, Arizona, New Mexico, and Nebraska; 102 (xii). The white pappus and cordate long-petiolate leaves are diagnostic for this species.

*Arnica diversifolia* Greene Plants 1.5–4.2 dm tall, the stems erect or ascending, simple or branched above, sparsely villous with multicellular hairs and often glandular, or almost glabrous; basal leaves smaller than the cauline and often withered by flowering time, borne on slender to broadly winged petioles shorter than or subequal to the blades; cauline leaves 2–4 (5) pairs, blades 2–8 cm long, 0.8–4 (6) cm wide, ovate or the uppermost lanceolate, the largest at the middle or below, becoming sessile to subsessile above, subentire or irregularly serrate; heads 1–3 or more, the peduncle apex sparsely to moderately villous with whitish hairs and often with glands; involucre 10–16 mm high; bracts lanceolate, acuminate to acute, sparsely to densely pilose and often glandular, ciliate, the tip lacking a tuft of hairs; rays usually 10–15, yellow; achenes 5–7 mm long, glabrous or sparsely and uniformly hairy; pappus brownish, subplumose. Stream sides, meadows, and scree slopes in spruce-fir and alpine tundra communities at 2560 to 3400 m in Duchesne, Grand, Piute, San Juan, Sanpete, Summit, Uintah, and Utah counties; Alaska and Yukon, south to Oregon and Colorado; 19 (ii). This taxon is not well collected in Utah. The broad leaves and brownish subplumose pappus are diagnostic for these plants that might be regarded as consisting of a series of hybrid derivatives between *A. mollis* and *A. cordifolia*, *A. latifolia*, or *A. rydbergii*. More work is necessary.

*Arnica fulgens* Pursh [*A. pedunculata* Rydb.]. Plants 1.5–6 (7) dm tall, the stems erect, the basal leaf axils with tufts of long brown woolly hair, otherwise stipitate-glandular and often hairy as well; basal

leaves smaller than the cauline, often withered at anthesis, with broadly winged petioles or subsessile; cauline leaves 2–4 pair, the blades oblanceolate to elliptic (often narrowly so), mostly 3–12 cm long, 0.6–4 cm wide, the largest ones near the base, becoming sessile upward, subentire to entire; heads 1–3, the peduncle apex yellowish villous; involucre 10–15 (18) mm high, the bracts narrowly elliptic to lance-elliptic, attenuate to an obtuse or acute apex, villous, the tips pubescent within; rays mostly 10–20, yellow to yellow-orange; achenes 4–5.5 mm long, densely hairy; pappus whitish to cream colored, barbellate. Dry sagebrush community at 2000 m in Daggett County; British Columbia to Saskatchewan, south to California, Nevada, and Colorado; 1 (0).

*Arnica latifolia* Bong. [*A. gracilis* Rydb.; *A. jonesii* Rydb.]. Plants 1–4 (6) dm tall, the stems erect or ascending, simple or branched above, sparsely villous with multicellular hairs and often glandular; basal leaves smaller than the cauline, usually withered by flowering time, the petioles (if any) usually shorter than the blades; cauline leaves 2–5 pairs, the blades 2–4.5 (7) cm broad, cordate-ovate to lanceolate, the largest ones at the middle or below, the lower ones with petioles shorter than the blades, the upper ones sessile or subsessile, serrate-dentate, less commonly entire or nearly so; heads 1–5 or rarely more, the peduncle apex sparsely to moderately villous with whitish or yellowish hairs and often glandular; involucres 9–17 mm high, the bracts lanceolate, acuminate to acute, sparsely pilose and often glandular, ciliate, lacking an apical tuft of hair; rays usually 8–12, yellow; achenes 5–8 mm long, glabrous or sparsely hairy, or glabrous in the lower portion; pappus white, barbellate. Lodgepole pine, spruce-fir, and alpine tundra communities at 2240 to 3400 m in Duchesne, Salt Lake, Summit, and Utah counties; Alaska and Yukon to California and Colorado; 24 (v). Specimens available for study are variable. They occur in the Uinta and Wasatch mountains and on the Tavaputs Plateau. The var. *gracilis* (Rydb.) Cronq. was reported from Utah by Maguire (l.c., as *A. gracilis* Rydb.), but has not been seen by me. It differs from the bulk of our material in its small size (1–3 dm), more numerous heads (3–9), and narrow



small involucre 9–13 mm high. The single collection cited by Maguire is from Salt Lake or Utah County. More material is necessary.

***Arnica longifolia* D.C. Eaton in Wats.** [*A. caudata* Rydb., type from Big Cottonwood Canyon]. Plants 3–10.5 dm tall; stems erect or sprawling, tufted from caudexlike shortened rhizomes, simple or branched above, shortly villous to puberulent and often somewhat glandular-viscid; basal leaves lacking or soon withering, the cauline ones 5.5–20 cm long, 0.6–3 cm wide, lanceolate to elliptic, with 3–5 main veins, puberulent, all sessile, 5–7 pairs, the largest near the middle of the stem, the lower ones connate-sheathing, entire or nearly so; heads 1–9, the peduncle apex sparingly yellowish villous; involucre 6–13 mm high, the bracts lanceolate to lance-oblong, acute to acuminate, sparingly pilose and glandular, ciliate, the tips sparingly white-hairy; rays mainly 8–13, yellow; achenes 4.5–5.5 mm long, glabrate, or uniformly stipitate-glandular; pappus brownish to straw colored, barbellate. Snow flushes, talus, and stream banks in lodgepole pine, aspen, ponderosa pine, Douglas fir, white fir, and spruce-fir communities at 1890 to 3325 m in Box Elder, Cache, Garfield, Grand, Juab, Rich, Salt Lake, Sanpete, Summit, Tooele, and Washington counties; Washington to Alberta, south to California, Nevada, and Colorado; 15 (i). Our material belongs to var. *longifolia*.

***Arnica mollis* Hook.** [*A. arachnoidea* Rydb., type from Big Cottonwood Canyon; *A. chamissonis* var. *longinodosa* A. Nels., type from near Marysvale; *A. ovata* Greene, type from Alta]. Plants 1.5–6.5 dm tall, the stems erect or ascending, loosely to compactly clump-forming, simple, or branched in inflorescence, puberulent to villous and glandular; basal leaves smaller than the cauline ones, often withered at anthesis, the cauline ones 4.5–18 cm long, 0.8–4 cm wide, oblanceolate to obovate, lanceolate or elliptic, the lower slenderly to broadly petiolate, becoming sessile upwards, 3–4 pairs, the largest below the middle, the lower connate-sheathing, entire to irregularly denticulate; heads 1–5 (7), the peduncle apex sparingly yellowish villous; involucre 10–17 mm high, the bracts lanceolate to lance-elliptic, acute to attenuate, sparingly to densely villous-pilose and more or less glandular, lacking a sub-

apical tuft of hair; rays mainly 12–18, yellow; pappus brownish, subplumose; achenes pubescent to stipitate-glandular. Meadows, bogs, stream banks, seeps, talus slopes, and rock stripes in sagebrush, ponderosa pine, lodgepole pine, Douglas fir, white fir, aspen, spruce-fir, and alpine tundra communities at 1950 to 3550 m in Box Elder, Cache, Daggett, Duchesne, Garfield, Juab, Kane, Piute, Rich, Salt Lake, Sanpete, Summit, Tooele, Uintah, and Utah counties; British Columbia to California, Nevada, and Colorado; 50 (xii).

***Arnica parryi* Gray.** Plants 1.5–5 (6) dm tall, erect or ascending, from elongate rhizomes, simple or branched in inflorescence, villous and more or less glandular; basal leaves smaller than the cauline ones, often withered at anthesis, the cauline ones long petioled below, becoming sessile upwards, the blades 2–9.5 cm long, 0.4–4 cm wide, lanceolate to ovate, the base obtuse to truncate or cuneate, 2–4 (5) pairs, the largest near the stem base, the lower connate-sheathing, entire to denticulate; heads 3–12, nodding in bud, the peduncle apex glandular-villous; involucre 10–16 mm high, the bracts narrowly lanceolate, acute to attenuate, glandular-villous, lacking a subapical tuft of hairs; rays lacking, or rarely present, yellow; pappus brownish, barbellate to subplumose; achenes glabrous to glandular or hairy. Aspen and spruce-fir communities at 2415 to 3175 m in Carbon, Daggett (?), Garfield, Iron, Salt Lake, Sanpete, and Summit counties; British Columbia and Alberta to California and Colorado; 9 (ii). A specimen from Piute County (Welsh et al. 14018 BRY) has ray flowers well developed.

***Arnica rydbergii* Greene.** Plants 1–2.6 dm tall, erect or ascending, from elongate rhizomes, sparingly villous and shortly stipitate-glandular; basal leaves smaller than the cauline, sometimes bladeless, often withered at anthesis, the cauline ones short to long petioled below, becoming sessile upwards, the blades 2–5 cm long, 0.4–1.5 cm wide, lanceolate to elliptic, ovate, or obovate, the base obtuse to cuneate, 2 or 3 (4) pair, the largest at or near the middle of the stem, the lower connate-sheathing, entire or denticulate; heads 1–5, the peduncle apex yellowish villous, glandular; involucre 9–13 mm high, the

bracts narrowly lanceolate, acute to attenuate, stipitate-glandular, ciliate, lacking a subapical tuft of hair; rays mainly 7–10, yellow; pappus white, barbellate; achenes shortly pilose. Spruce-fir and lodgepole pine forests in Duchesne, Summit, and Utah counties; British Columbia and Alberta to Oregon and Colorado; 12 (iii).

***Arnica sororia* Greene** Plants 1.5–6 dm tall, the stems erect, the basal axils lacking tufts of hair, otherwise more or less villous and glandular; basal leaves smaller than the cauline, often withered at anthesis, with winged to narrow petioles or sessile; cauline leaves 2–4 pair, the blades lanceolate to elliptic, mostly 3–10 cm long, 0.5–2 cm wide, the largest ones near the base, becoming sessile upward, mainly entire; heads 1–3, the peduncle apex sparingly villous; involucre 10–15 mm high, the bracts narrowly oblong-lanceolate, attenuate, villous, the tips more or less hairy within; rays mainly 9–15, yellow; achenes 4–6 mm long, densely short-hairy; pappus white, barbellate. Meadows and foothills in sagebrush and aspen communities at 1675 to 2100 m in Cache and Rich counties; Alberta and British Columbia to Wyoming, Nevada, and California; 2 (0).

ARTEMISIA L.

Annual, biennial, or perennial herbs, subshrubs, or shrubs from taproots, caudices, or rhizomes, the juice watery; stems decumbent to ascending or erect, simple or branched; leaves alternate or basal, entire or toothed, lobed, or divided; heads several to numerous, borne in spicate, racemose, or panicleate clusters; involucre bracts imbricate in several series, dry, at least the inner with scarious margins; receptacle naked or beset with long hairs, often glandular; corollas of disk flowers only (rarely with minute bilabiate ray flowers in *A. bigelovii*), perfect, or sometimes the central ones sterile, the marginal merely pistillate; marginal corollas tubular (or bilabiate), the central ones tubular-funnelform; pappus lacking, or a short crown; style branches flattened; achenes subterete or angular, glabrous.

BEETLE, A. A. 1960. A study of sagebrush — The section Tridentate of *Artemisia*. Univ. Wyoming Agr. Expt. Sta. Bull. 368. 83 pp.

KECK, D. D. 1946. A revision of the *Artemisia vulgaris* complex in North America. Proc. Calif. Acad. 25:421–468.

1.	Plants shrubs or subshrubs .....	2
—	Plants herbs .....	13
2(1).	Heads with both ray and disk flowers, the ray flowers 2-lipped; branchlets of inflorescence spreading to reflexed; plants of rimrock areas in Colorado drainage, rarely in southern Great Basin .....	<i>A. bigelovii</i>
—	Heads discoid; branchlets of inflorescence variously disposed; plants seldom of rimrock, the distribution various .....	3
3(2).	Leaves 1 to 3-pinnately or ternately dissected, the segments linear .....	4
—	Leaves entire or toothed, or if lobed, the lobes oblong or broader, or if linear (see <i>A. filifolia</i> ), tall shrubs of sandy areas at low elevations .....	6
4(3).	Plants silvery-canescens; receptacle hairy; growing commonly on windswept ridges, but not always so restricted .....	<i>A. frigida</i>
—	Plants green to gray-green; receptacle glabrous, or, if hairy, plants of low elevations .....	5
5(4).	Shrubs with spreading branches, spinescent, flowering in springtime ....	<i>A. spinescens</i>
—	Shrubs with erect or ascending branches, not spinescent, flowering in late summer and autumn .....	<i>A. pygmaea</i>
6(3).	Leaves linear-filiform, less than 1 mm wide, entire, or 3-parted; tall plants of sandy low elevation sites .....	<i>A. filifolia</i>
—	Leaves broader, entire, or the segments broader than 1 mm wide; plants of various habitats and elevations .....	7

7(6).	Leaves entire or with 1 or 2 teeth; heads borne in slender panicles; plants of high elevations .....	<i>A. cana</i>	
—	Leaves toothed or lobed at the apex; heads borne in slender spicate to broad panicles .....		8
8(7).	Plants usually less than 3 dm tall; leaves usually less than 1 cm long; foliage dull yellow- to lead-gray or rarely silvery .....	<i>A. nova</i>	
—	Plants mainly more than 3 dm tall; leaves usually more than 1 cm long (at least some); foliage silvery-canescenscent .....		9
9(8).	Leaves all, or many of them, deeply cleft into narrowly oblong lobes which may be further divided; flowers commonly 5–8 per head .....	<i>A. tripartita</i>	
—	Leaves mainly merely toothed apically; flowers various .....		10
10(9).	Leaves coarsely and deeply 3-lobed, the lobes broad and rounded apically; inflorescence narrow, seldom over 1.5 cm wide; plants of Rich and Summit counties .....	<i>A. longiloba</i>	
—	Leaves variously 3- to 5-toothed, seldom lobed; inflorescence various; plants variously distributed .....		11
11(10).	Inflorescence open, paniculate, commonly more than 2 cm wide; plants of broad distribution, our common sagebrush species .....	<i>A. tridentata</i>	
—	Inflorescence narrow, spicate, commonly less than 1.5 cm wide; plants less broadly distributed .....		12
12(11).	Plants often less than 4 dm tall; leaves mainly less than 1.5 cm long; heads small; plants usually of middle elevations .....	<i>A. arbuscula</i>	
—	Plants often over 4 dm tall; leaves mostly over 2 cm long; heads large; plants of high elevations .....	<i>A. spiciformis</i>	
13(1).	Leaves all entire, or the lower ones toothed or lobed, glabrous and green above and beneath, or white-hairy on both surfaces (see also <i>A. carruthii</i> and <i>A. michauxiana</i> ), usually much longer than broad .....		14
—	Leaves deeply incised, pinnatifid, or ternately divided, variously pubescent, various in length-width proportions .....		15
14(13)	Leaves green above and beneath; central flowers of heads with normal ovaries .....	<i>A. dracunculus</i>	
—	Leaves white-hairy above and beneath or green above; central flowers of head with abortive ovaries .....	<i>A. ludoviciana</i>	
15(14).	Plants annual or biennial from a taproot; leaves green, essentially glabrous; adventive .....		16
—	Plants perennial from a rhizome or caudex; leaves tomentose, strigose, or pilose ...		17
16(15).	Inflorescence paniculate, loose and open; heads borne on short peduncles; involucre 1–2 mm high .....	<i>A. annua</i>	
—	Inflorescence a spicate panicle, the branches appressed-ascending; heads sessile or nearly so; involucre more than 2 mm high .....	<i>A. biennis</i>	
17(15).	Cauline leaves reduced upwards, the largest leaves in a basal rosette, silvery-villous to strigulose, scarcely tomentose and uniformly colored above and beneath; plants from caudices, only occasionally rhizomatous .....		18
—	Cauline leaves not especially reduced upwards, seldom with a basal rosette, variously tomentose and often bicolored; plants often rhizomatous (except in <i>A. absinthium</i> ) .....		20



- 18(17). Pubescence of leaves loosely villous to glabrous; corollas hairy, the receptacle glabrous; plants of high elevations in the Uinta and La Sal mountains ..... 19
- Pubescence of leaves appressed strigose or villosulose; corollas glabrous or hairy, but, if hairy, the receptacle long-villous; plants variously distributed ..... 20
- 19(18). Involucres 3–4 mm high; plants of the La Sal Mountains ..... *A. parryi*
- Involucres 4–5.3 mm high; plants of the Uinta Mountains ..... *A. norvegica*
- 20(19). Inflorescence a spicate raceme; receptacle and corolla long-villous; plants of high elevations ..... *A. scopulorum*
- Inflorescence a slender panicle; receptacle and corollas glabrous; plants of low elevations, seldom of high elevations ..... *A. campestris*
- 21(17). Receptacle beset with numerous long hairs between the flowers; leaves about equally hairy above as below; plants introduced, weedy, of low elevations ..... *A. absinthium*
- Receptacle naked; leaves more or less tomentose below, usually green or greenish above, or equally tomentose on both sides; plants indigenous, not weedy, of mid-to-high elevations ..... 22
- 22(21). Leaves entire or with entire lobes; plants of moderate elevations in central and southern Utah ..... *A. carruthii*
- Leaves bipinnatifid, the lobes again toothed; plants of high elevations in the Uinta, Wasatch, and La Sal mountains ..... *A. michauxiana*

*Artemisia absinthium* L. Absinthe. Perennial fragrant herbs from a rhizomatous caudex, 5–10 (12) dm tall, appressed sericeous; leaves bi- or tripinnatifid, the main lobes again lobed or toothed, silvery-sericeous on both surfaces, with very short tangled hairs, hardly tomentose, 1.5–5.5 cm long on flowering stems (2–10 cm long on sterile stems) the main ultimate segments mostly 2–4 mm wide, petiolate below, shortly petiolate and less commonly divided above; involucre 2–3 mm high, the bracts scarious over the greenish center, the margins brownish hyaline; flowers all fertile, the marginal ones pistillate; receptacles with numerous long slender hairs; achenes glabrous. Roadsides, streambanks, and abandoned fields in Garfield, Rich, and Utah counties; widely established in North America; adventive from Europe; 6 (ii).

*Artemisia annua* L. Sweet Wormwood. Annual fragrant herbs, mainly 0.3–1.5 (3) m tall; stems sparingly glandular; leaves 2- or 3-pinnatifid, the main lobes again lobed, green and minutely glandular on both surfaces, 1.5–8 (10) cm long, the main ultimate segments 0.5–3 mm wide, petiolate below, subsessile or shortly petiolate above; involucre 1.3–2 mm high; involucral bracts with green

centers minutely glandular, the margins hyaline; receptacles naked; achenes glabrous. Introduced weedy species of disturbed sites in Washington County; adventive from Eurasia, now widely naturalized in North America; 1 (0).

*Artemisia arbuscula* Nutt. Low Sagebrush. [*A. tridentata* ssp. *arbuscula* (Nutt.) H. & C.; *A. tridentata* var. *arbuscula* (Nutt.) McMinn]. Shrubs, commonly 2–4 (5) dm tall, the vegetative stems 1.5–10 cm long, the flowering stems erect, 8–30 cm long; leaves 0.4–1.6 cm long, shallowly 3- to 5-dentate to deeply lobed, cuneate basally, appressed canescent; inflorescence spicate, mostly less than 2 cm wide; involucre 4–6 mm long, campanulate; involucral bracts 4–8, canescent, the margins brownish-scarious; flowers 4–9, all perfect; receptacle naked; achenes glabrous. Pinyon-juniper, mountain brush, sagebrush, white fir, aspen, and spruce-fir communities at 1375 to 2550 m in Box Elder, Cache, Millard, Rich, Salt Lake, Summit, and Tooele counties; Washington to Montana, south to California and Nevada; 14 (0). *A. arbuscula*, or low sagebrush, has been confused with both *A. tridentata* and *A. nova*. It can be distinguished from the former by its narrow inflorescence, and from the latter by its canescent involucre. Beetle (l.c.) reports



intermediates with *A. longiloba*, a taxon with broadly campanulate heads and bluntly lobed leaves.

***Artemisia biennis* Willd.** Biennial Wormwood. Plants annual or biennial, with taproots, the stems 0.3–9 (10) dm tall or more, glabrous; basal leaves often withered by anthesis; cauline leaves well developed, 1.5–10 (15) cm long, once pinnately divided, the segments oblong to oblanceolate, again toothed, essentially glabrous, green; inflorescence spicate or in spicate panicles; heads numerous, crowded, sessile or subsessile, erect or nearly so; involucre 2–3 mm high, 2–4 mm broad, the bracts glabrous, greenish to yellowish, the margins hyaline; marginal flowers perfect, fertile, the corollas glabrous; receptacle and achenes glabrous. Floodplains, lake beds and shores, mud flats, and pond margins at 1375 to 2900 m in Cache, Duchesne, Garfield, Grand, Iron, Millard, Salt Lake, Sanpete, Tooele, Uintah, and Utah counties; widespread in North America, where presumably indigenous in the western portion; Europe; 20 (v).

***Artemisia bigelovii* Gray** Bigelow Sagebrush. Shrubs, commonly 2–7 (10) dm tall or more, the vegetative stems 1–3 dm long, the flowering stems erect, 3–4.5 dm tall; leaves 0.3–2.3 cm long, 1–7 mm wide, entire or shallowly 3-toothed, basally cuneate, appressed to loosely canescent-tomentose; inflorescence narrowly paniculate, mostly less than 4 cm wide, the branches often lax and with heads tending to be pendulous; involucre mainly 2.5–3.5 mm high, subcylindric to narrowly campanulate, the bracts 5–10, silvery canescent, with narrow scarious margins; flowers 3 or 4, imperfect or some perfect, the marginal pistillate (ray) flowers bilaterally symmetrical; receptacle naked; achenes glabrous. Rimrock areas in pinyon-juniper and mixed desert shrub communities at 975 to 2135 m in Duchesne, Emery, Garfield, Grand, Kane, Millard, San Juan, Sevier, Uintah, and Wayne counties; California and Nevada east to Colorado, New Mexico, and Texas; 45 (xvii).

***Artemisia campestris* L.** Field Wormwood. Perennial herbs from a caudex and taproot, the stems (1.5) 2.5–7 dm tall (rarely taller), tomentose or glabrous; basal leaves well-developed (often withered at anthesis), 2–12 cm

long, 2- to 3-pinnatifid or ternate, the segments linear to narrowly oblong or spatulate, villous or pilose to glabrous on both sides; cauline leaves reduced upwards, once pinnatifid, ternate, or entire; inflorescence of narrow to lax panicles; heads numerous, shortly pedunculate on contracted to lax branchlets, finally pendulous; involucre 2.5–3.8 mm high, 2–2.3 mm wide, the bracts glabrous, greenish to yellowish, the margin hyaline; marginal flowers pistillate, fertile, the corollas glabrous; disk flowers sterile, the ovaries abortive; receptacle and achenes glabrous. Saltbush, greasewood, sagebrush, mountain brush, and pinyon-juniper communities, mainly in dunes and other sandy sites at 1250 to 2075 m in Emery, Garfield, Grand, Kane, San Juan, Sevier, Washington, and Wayne counties; Arizona, New Mexico, Colorado, Wyoming, and west to the Pacific; 24 (vii). Our material is assignable to ssp. *boREALIS* (Pallas) H. & C., in a broad sense, and belongs to var. *scouleriana* (Benth.) Cronq. [*A. pacifica* Nutt.; *A. campestris* ssp. *pacifica* (Nutt.) H. & C.; *A. forwoodii* authors, not Wats.; *A. caudata* authors, not Michx.] in a more narrow sense.

***Artemisia cana* Pursh** Silver Sagebrush. Shrubs, commonly 2.5–12 (15) dm tall, the vegetative branches 1–3 (5) dm long; flowering stems erect, 1–3 dm tall; leaves 0.8–5.3 (7) cm long, linear to narrowly elliptic or oblong, entire, or some of them toothed or deeply lobed, usually acute basally, acute to obtuse apically, appressed tomentose; inflorescence narrowly spicate or glomerate-paniculate, mostly less than 5 cm wide, often conspicuously bracteate, the branches, when present, erect, the heads erect; involucre 3.3–6.1 mm high, 3.5–6 mm wide, campanulate; bracts numerous, the outer silvery-canescenscent, with greenish median, the margins brownish scarious, rounded-erose; flowers 10–20, perfect; receptacle naked; achenes glabrous. Meadows and stream terraces, less commonly on moist slopes away from meadows and streams at 2270 to 3050 m in Cache, Carbon, Daggett, Duchesne, Emery, Garfield, Iron, Juab, Kane, Piute, Rich, Sanpete, Sevier, Summit, Utah, Wasatch, and Washington counties; British Columbia to Saskatchewan, south to California, Nevada, and New Mexico. Our materials are assigned to

var. *viscidula* Osterh. [*A. cana* ssp. *viscidula* (Osterh.) Beetle], which differs from typical var. *cana* in its smaller, narrower leaves and less canescent herbage. Silver sagebrush forms intermediates with both *A. tridentata* var. *vaseyana* and *A. spiciformis*, within whose altitudinal range it occurs, but whose habitats are ordinarily separate; 42 (viii).

*Artemisia carruthii* Wood ex Carruth Carruth Wormwood. [*A. wrightii* Gray; *A. vulgaris* ssp. *wrightii* (Gray) H. & C.]. Plants perennial herbs, with well-developed rhizomes, the stems 2–7 dm tall, sparingly to densely tomentose; basal leaves not well developed; cauline leaves various but usually pinnatifid with linear lobes, those of innovations and sometimes the primary ones at base of flowering stems entire or merely lobed, 0.6–3 cm long, the lobes 0.5–1.5 (2) mm wide, linear or narrowly oblong, tomentose on both sides, or less so above; inflorescence paniculate (narrowly so) or spicate; heads numerous, shortly pedunculate to sessile, erect; involucre 2.3–3 mm high, 2–2.5 mm wide, the bracts sparingly tomentose, pale greenish with hyaline margins; marginal flowers pistillate, fertile; central flowers perfect, fertile, the corollas glabrous; receptacle and achenes glabrous. Canyon bottoms, slopes, and rock outcrops in sagebrush, mountain brush, aspen, and spruce-fir communities at 1890 to 3050 m in Emery, Iron, Piute, San Juan, Utah, and Washington counties, and likely elsewhere; east to Kansas and south to Arizona, New Mexico, and Texas. This taxon is allied to *A. ludoviciana*, and some specimens appear to be intermediate between them. There is justification for inclusion of *A. carruthii* within an expanded *A. ludoviciana*, but no formal proposal is intended or implied herein. The deeply pinnatisect main foliage leaves are thought to be diagnostic. The species has not been collected in sufficient numbers as to understand its distribution in any definitive manner; 16 (ii).

*Artemisia dracunculus* L. Terragon. [*A. glauca* Pallas; *A. dracunculus* ssp. *glauca* (Pallas) H. & C.; *A. aromatica* A. Nels.; *A. dracunculoides* Pursh]. Plants shortly rhizomatous, perennial herbs, the stems (2) 5–12 (15) dm tall, glabrous (rarely tomentose?); leaves primarily cauline, entire or rarely a

few of them cleft, 1.2–7.5 cm long, 1–6 mm wide, glabrous, green on both surfaces; inflorescence paniculate; heads numerous, short-pedunculate to sessile, more or less pendulous; involucre 2–2.8 mm high, 2.2–3 mm wide, the bracts glabrous, greenish, with broad hyaline margins; marginal flowers pistillate, fertile; central flowers sterile, the ovaries abortive, the corolla glabrous (often glandular); receptacle and achenes glabrous. Rabbitbrush, sagebrush, skunkbush, wildrye, salt desert shrub, pinyon-juniper, ponderosa pine, aspen, spruce-fir, and hanging garden communities at 1220 to 3200 m in Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane, Millard, Piute, San Juan, Sanpete, Sevier, Tooele, Uintah, Utah, Wasatch, Washington, and Wayne counties; Yukon southeast to Illinois and south to Mexico. Our material fits within the concept of var. *glauca* (Pallas) Bess. in Hook., which is probably not separable from var. *dracunculus* of the Old World; 63 (xvii).

*Artemisia filifolia* Torr. Sand Sagebrush; Old-man Sagebrush. Shrubs commonly 5–15 dm tall, the vegetative branches 1–3 dm long; flowering branches erect, 1.5–6 dm long; leaves 0.6–8 cm long, 0.3–1.5 mm wide, revolute (appearing terete) or somewhat flattened (and still revolute), entire or the lower ternate, appressed villous-tomentose; inflorescence paniculate, mostly more than 3 cm wide, conspicuously bracteate, the branches erect, the heads pendulous; involucre 1.6–2.2 mm long 1.5–2.2 mm wide, campanulate to subglobose; bracts 5–9, densely silvery canescent; flowers 3–9, the marginal ones pistillate, fertile, the central ones sterile; receptacle naked; achenes glabrous. Sandy sites in blackbrush, creosote bush, ephedra, *Poliomintha*, *Eriogonum*, rabbitbrush, and pinyon-juniper communities at 825 to 2290 m in Emery, Garfield, Grand, Iron, Kane, San Juan, Washington, and Wayne counties; Colorado and South Dakota, south to Arizona, Texas, and Mexico; 43 (vi).

*Artemisia frigida* Willd. Fringed Sagebrush; Prairie Sagewort. Shrubs 0.5–4.5 dm tall, white-tomentose to strigulose; flowering stems arising from short prostrate or ascending woody offsets; leaves of basal offsets

much like the stem leaves, 0.5–1.5 (2.5) cm long, 2- to 3-ternately (or subpinnately) divided into linear segments mainly 0.3–0.8 mm wide, often with stipulelike divisions near the base, whitish pilose-tomentose throughout (fading brownish); inflorescence paniculate or less commonly borne sessile or on very short peduncles; involucre 2–3.5 mm high, 4–6 mm broad, the bracts pilose-tomentose, with brownish scarious margins; marginal flowers pistillate, fertile; central flowers perfect, fertile, the corolla glabrous (often glandular), yellow or tinged reddish; receptacle long-hairy; achenes glabrous. Shadscale, sagebrush, pinyon-juniper, ponderosa pine, mountain brush, aspen, spruce, and alpine (often on windswept ridge crests) communities at 900 to 3480 m in Box Elder, Carbon, Duchesne, Emery, Garfield, Grand, Juab, Kane, Millard, Piute, San Juan, Sanpete, Sevier, Summit, Uintah, Utah, Wasatch, and Wayne counties (likely elsewhere); Alaska to Quebec, south to Arizona and Kansas; Asia; 78 (x).

***Artemisia longiloba* (Osterh.) Beetle**  
Longleaf Sagebrush. [*A. spiciformis* (?) *longiloba* Osterh.]. Shrubs, mainly 2–5 dm tall, appressed villous-tomentose; flowering stems 1–2 dm long; leaves 0.4–2 cm long, broadly cuneate, deeply 3-lobed, the lobes obtuse, appressed villous-tomentose; inflorescence spicate, the heads several, shortly pedunculate to sessile, erect; involucre 4–6 mm high, 3–5 mm wide, the 4–12 bracts villous-tomentose, green, with brownish scarious margins; marginal flowers perfect, fertile, central flowers

perfect, fertile, the corolla glabrous (glandular), cream colored; receptacle and achenes glabrous. Sagebrush and grass communities at 1675 to 2440 m in Rich and Summit counties; Oregon to Montana, south to Nevada and Colorado. This entity is reported to grow in tight to heavy soils (Beetle 1960) and matures seed in July and August. The plants have large heads similar to those of *A. cana* and the low habit of *A. nova*. Possibly they would best be treated within an expanded *A. tridentata*, but no combination is proposed herein; 4 (0).

***Artemisia ludoviciana* Nutt.** Perennial rhizomatous herbs, the stems 2–10 dm tall (or more), white-tomentose or glabrate to glabrous; leaves mainly cauline, entire, lobed, or pinnately incised, white-tomentose below, green and glabrous or tomentose above (rarely glabrous throughout), 0.8–9 cm long, 0.1–1 (2) cm wide; inflorescence spicate to paniculate; heads numerous, shortly pedunculate to sessile, more or less pendulous; involucre 2.5–4.5 mm high, 3–7 mm wide (or more), the bracts tomentose to glabrous, with broad scarious margins; marginal flowers pistillate, fertile; central flowers perfect, fertile, the corolla glabrous, yellow; receptacle and achenes glabrous. This is a wide spread species of many phases and habitats. In Utah there are five more or less distinctive varieties. Two of the varieties, *ludoviciana* and *incompta* are especially abundant, the remaining three less so. Not all specimens are readily separable into the named varieties, and the following key is arbitrary.

- 1. Inflorescence an open panicle, often more than 8 cm wide; plants of southern and southeastern Utah ..... 2
- Inflorescence a spicate panicle, usually less than 6 cm wide; plants of various distribution ..... 3
- 2(1). Leaves mainly less than 2.5 cm long, the margin often narrowly revolute ..... *A. ludoviciana* var. *albula*
- Leaves mainly over 2 cm long, the margins not revolute ..... *A. ludoviciana* var. *mexicana*
- 3(1). Leaves entire or less commonly some of them toothed or lobed ..... *A. ludoviciana* var. *ludoviciana*
- Leaves more or less deeply parted or divided ..... 4
- 4(3). Involucres 3.5–4.2 mm high, 4–7 mm wide ..... *A. ludoviciana* var. *latiloba*
- Involucres 2.5–3.5 (3.8) mm high, 2.5–5 mm wide ..... *A. ludoviciana* var. *incompta*



**Var. *albula*** (Wooton) Shinnars [*A. albula* Wooton, nomen novum pro *A. microcephala* Wooton]. This distinctive short-leaved variety has open inflorescences; it occurs in riparian areas with rabbitbrush, cottonwood, and copperweed at 880 to 1680 m in Emery, Garfield, Kane, San Juan, and Washington counties; Nevada and Colorado south to Mexico; 4 (ii).

**Var. *incompta*** (Nutt.) Cronq. [*A. incompta* Nutt.; *A. ludoviciana* ssp. *incompta* (Nutt.) Keck]. The deeply lobed or cleft leaves and compactly spicate inflorescence are diagnostic. The plants occur at moderate to high elevations (2135 to 3500 m) in aspen, spruce-fir, willow-wet meadow, and riparian communities in Cache, Carbon, Duchesne, Juab, Millard, Piute, Salt Lake, San Juan, Sanpete, Sevier, Summit, Tooele, Utah, and Wasatch counties; Oregon to Montana, south to California, Nevada, and Colorado; 65 (vi). This variety passes by degree into *A. michauxiana* at high elevations.

**Var. *latiloba*** Nutt. [*A. candicans* Rydb.; *A. ludoviciana* ssp. *candicans* (Rydb.) Keck]. This variety is similar to var. *incompta*, differing in larger (higher and wider) heads. It is poorly understood in Utah, where it was reported by Keck (1946) from Cache County. Our one specimen is from Utah County, without locality data; 1 (0).

**Var. *ludoviciana*** [*A. gnaphaloides* Nutt.; *A. ludoviciana* var. *gnaphaloides* (Nutt.) T. & G.; *A. purshianus* Bess. in Hook.]. The typical variety is a plant with entire or cleft (rarely deeply cleft or parted) leaves and loose, but not open, inflorescences. Rabbitbrush, sagebrush-grass, mountain brush, pinyon-juniper, ponderosa pine, and hanging garden communities at 880 to 2750 m in all Utah counties, except for Morgan, Piute, and Summit (and likely there also); British Columbia to Ontario, south to California, Arizona, New Mexico, Texas, and Indiana; 86 (xvi).

**Var. *mexicana*** (Willd.) Fern. [*A. mexicana* Willd.; *A. ludoviciana* ssp. *mexicana* (Willd.) Keck]. This is the long-leaved plant with open inflorescences; it forms the counterpart of var. *albula*. It is a component of riparian, pinyon-juniper, ponderosa pine, and aspen communities at 750 to 2600 m in Garfield, Grand, Kane, San Juan, Washington, and

Wayne counties; Colorado to Missouri, south to Mexico; 17 (viii).

***Artemisia michauxiana* Bess.** Michaux Wormwood. [*A. discolor* Dougl. ex Bess.]. Perennial herbs, the stems 0.8–4 dm tall (rarely more), white tomentose to glabrate or glabrous; leaves mainly cauline, 0.5–4 (5) cm long and about as broad, bipinnately dissected, the secondary segments again toothed or lobed, acute, the uppermost seldom entire, commonly green above and tomentose beneath, but often green beneath also; inflorescence spicate; heads several to numerous, commonly pedicellate, erect or nodding; involucre 3.4–4.4 mm high, 3–6 mm wide, the bracts glabrous or sparingly tomentose, green, the broad margins brownish scarious and erose-ciliate; marginal flowers pistillate, fertile; central flowers perfect, fertile, the corolla glabrous (glandular), yellow; receptacle and achenes glabrous. Spruce-lodgepole pine and alpine tundra communities, often in boulder stripes and talus, at 2950 to 3500 m in Duchesne, San Juan, Summit, and Utah counties (Uinta, La Sal, and Wasatch mountains); British Columbia and Alberta south to Nevada and Wyoming; 11 (ii). Keck (1946) notes that *A. michauxiana* is connected through a series of intermediates with *A. ludoviciana* var. *incompta* in Nevada specimens. This is true for ours also. There appears to be some justification for treating *A. michauxiana* within an enlarged *A. ludoviciana*, but such a combination is not implied herein.

***Artemisia norvegica* Fries** Spruce Wormwood. Perennial herbs, 2–4.1 dm tall, from a simple or branched caudex and stout taproot, the caudex branches short, clothed with persistent leaf bases, the flowering stems arising directly from the caudex, villous, often reddish; leaves of basal rosettes 2–19 cm long, bi- or tripinnatifid, the segments lance-attenuate to acute, villous on both surfaces; cauline leaves becoming smaller upwards, often with stipulelike divisions near the base; inflorescence racemose; heads several to numerous, finally nodding, the peduncles to 4.5 cm long; involucre 4–5.3 mm high, 6–11 mm wide, the bracts sparingly to densely villous-pilose, more or less green, the margins broadly dark brownish scarious; marginal



flowers pistillate, fertile; central flowers perfect, fertile, the corollas long-hairy from near the base, cream colored; receptacle and achenes glabrous. Spruce-fir, lodgepole pine, and alpine tundra communities in Duchesne and Summit counties; Alaska east to Mackenzie, and south to California and Colorado. Our material belongs to var. *piceetorum* Welsh & Goodrich in Welsh; 4 (iii).

***Artemisia nova* A. Nels.** Black Sagebrush. [*A. tridentata* ssp. *nova* (A. Nels.) H. & C.; *A. tridentata* var. *nova* (A. Nels.) McMinn; *A. arbuscula* ssp. *nova* (A. Nels.) Ward]. Shrubs, 1–3 (5) dm tall, the main branches spreading, the vegetative stems 1–3 dm long (rarely more); flowering stems mainly 1.5–3 (4) dm long; leaves 0.3–2.1 cm long, shallowly to deeply 3- to 5-lobed or -toothed, the lobes or teeth rounded, often lead-gray or gray green, cuneate basally, appressed canescent and often minutely punctate; inflorescence narrowly paniculate, seldom more than 3 cm wide; involucre 3.1–5.8 mm long, 1.4–3.4 mm wide, cylindric to narrowly campanulate; bracts 8–12, canescent to glabrous, green to yellowish, the margin hyaline; flowers 3–8, all perfect; receptacle glabrous; achenes glabrous. Horsebrush, greasewood, shadscale, ephedra, juniper, sagebrush, rabbitbrush, winterfat, pinyon-juniper, and mountain brush communities at 1400 to 2600 m in Beaver, Box Elder, Cache, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane, Millard, Piute, Rich, San Juan, Sanpete, Sevier, Summit, Tooele, Uintah, and Weber counties; Oregon to Montana, south to California, Arizona, and New Mexico; 57 (x). Black sagebrush forms intermediates with all other members of the section *Tridentatae* that it contacts. The intermediates form narrow bands along lines of contact, but generally the habitats are mutually exclusive. There is little justification for considering black sagebrush in an expanded *A. tridentata* unless one is willing to accept most of the remainder of the section as portions of that species also.

***Artemisia parryi* Gray** Parry Wormwood. Perennial herbs, 0.8–2 (4) dm tall, from a simple or branched caudex and stout taproot, the caudex branches short, clothed with persistent leaf bases, the flowering stems arising

directly from the caudex, sparingly and loosely villous to glabrous, often reddish; leaves of basal rosettes 2–4 (8) cm long, twice pinnatifid, the segments oblong to lance-oblong, sparingly and loosely villous (to glabrous?); cauline leaves becoming smaller upwards; inflorescence racemose to subspicate; heads several to numerous, commonly nodding, the peduncles 1–5 mm long; involucre 3–4 mm long, 3–5 mm wide, the bracts sparingly villous to glabrate, with green to brownish middle and brownish scarious margins; marginal flowers pistillate, fertile; central flowers perfect, fertile, the corollas long-hairy (to glabrous?); receptacle and achenes glabrous. Alpine sites in the La Sal Mountains (Grand and San Juan counties); Colorado; 0 (0). The species is reported for Utah by Hall and Clements (l.c.), but no specimens have been seen from the state by me. Possibly it is only a phase of *A. norvegica*.

***Artemisia pygmaea* Gray** Pygmy Sagebrush. Shrubs 0.5–2 dm tall, from superficial woody caudexlike branches and stout taproots, the vegetative stems to 0.5 dm long; flowering stems erect to 2 dm tall; leaves 0.3–1 cm long, pinnately (or subbipinnately) 3- to 10-lobed, the lobes acute, yellow- to gray-green, sparingly villous to glabrous; inflorescence spicate or narrowly paniculate, less than 2 cm wide; involucre 5.2–6.3 mm high, 3–4.5 mm wide, cylindric or becoming campanulate upon drying; involucral bracts oblong, 15 or more, sparingly villous to glabrous, green, the margins stramineous-hyaline; marginal flowers lacking; central flowers 3–5, perfect, fertile, the corollas cream colored, glandular; receptacle and achenes glabrous. Black sagebrush, rabbitbrush, shadscale, greasewood, juniper, pinyon-juniper, and ponderosa pine communities at 1600 to 2300 m in Beaver, Duchesne, Emery, Garfield, Iron, Millard, Piute, Sevier, and Uintah counties (likely elsewhere); Arizona and Nevada; 27 (viii). This dwarf sagebrush occurs in peculiar edaphic situations on Green River Shale, in clay soils forming the matrix in igneous gravels, on calcareous gravels, and on dolomitic outcrops and gravels. It is often a component of communities that support rare plant species.

***Artemisia scopulorum* Gray** Dwarf Sage-wort. Perennial herbs, 0.5–3.7 dm tall, from a

simple or branched caudex and stout taproot, the caudex branches short, clothed with persistent leaf bases, the flowering stems arising directly from the caudex, appressed pilose to loosely and sparingly villous, often reddish or purplish; leaves of basal rosettes 1.5–9 cm long, twice pinnatifid, the segments oblong to elliptic, pubescent like the stems; inflorescence spicate to racemose; heads several to numerous, erect or nodding, the peduncles lacking, or to 2.3 cm long; involucre 3–5.2 mm high, 3–8 mm wide, the bracts villous, green to brownish in the middle, the margins brown-scarious; marginal flowers pistillate, fertile; central flowers perfect, fertile, the corollas cream colored, long-hairy; receptacle copiously long-villous; achenes glabrous. Talus slopes, moraines, and outwash plains and terraces in alpine tundra and meadows in spruce, lodgepole pine, and Douglas fir communities at 3050 to 4000 m in Boulder, Tushar, La Sal, and Uinta mountains; Beaver, Duchesne, Garfield, Grand, Piute, Summit, and Uintah counties; Montana, Wyoming, Colorado, and New Mexico; 30 (xi). The hairy corollas and long-villous receptacles are diagnostic for this distinctive species.

*Artemisia spiciformis* Osterh. Osterhout Sagebrush. Shrubs, mainly 5–8 dm tall, the vegetative stems 0.4–1 dm long, the flowering stems erect, 1.5–3.4 dm long; leaves 1.7–5.7 cm long, shallowly to deeply 3- to 5-lobed or -toothed, often widest below the teeth, the lobes acute to obtuse (or rounded) or lacking, gray-green, long-cuneate basally, appressed villous-canescens; inflorescences narrowly paniculate, usually less than 4 cm wide; involucre 5–6.3 mm long, 3.5–7 mm wide, cylindric to campanulate; involucre bracts 8–12 or more, canescent to glabrate, green, with broad yellowish brown scarious margins; flowers 6–10 or more, all perfect; receptacle and achenes glabrous. Ridge margins and snow-flushes in sagebrush-grass, snowberry, aspen, spruce-fir, and Douglas fir communities at 2680 to 3050 m in Cache (?), Duchesne, Emery, Juab, Sanpete, Summit, Tooele, and Wasatch counties (likely elsewhere); Colorado and Wyoming; 16 (ii). This is the material which has long passed under the name of *A. rothrockii* Gray in Utah.

Resemblance to that species appears to be superficial, with relationships running to both *A. cana* and *A. tridentata* var. *vaseyana*. Its habitat is intermediate between the high elevation, moderately xeric conditions of var. *vaseyana*, and the more mesic stream terrace and valley bottoms of *A. cana*.

*Artemisia spinescens* D.C. Eaton in Wats. Budsage. Shrubs, flowering in springtime, the branches spreading and often prostrate, 0.5–3 dm long or more, the vegetative stems mainly 0.3–0.8 dm long, commonly surpassing the flowering stems; leaves 0.4–2 cm long, petiolate, the blade palmately 3- to 5-cleft, the main divisions again cleft, sub-orbicular in outline, villous; inflorescence of short leafy-bracted racemose or spicate branches, or of solitary heads, the rachis persistent as a thorn; involucre 2–3.5 mm high, 3.5–5 mm wide; involucre bracts 4–8, villous, green, with narrow hyaline margins; flowers 6–20 or more, the marginal ones pistillate, fertile, the central ones sterile; corollas copiously long-hairy; receptacle naked; achenes long-hairy. Silty, clayey, or gravelly, often saline, substrates in black sagebrush, shadscale, tetradymia, greasewood, blackbrush, juniper, and winterfat communities at 1200 to 1925 m in Carbon, Duchesne, Emery, Garfield, Juab, Kane, Millard, Piute, San Juan, Sevier, Tooele, Uintah, and Utah counties; Oregon to Montana, south to California and New Mexico; 92 (vii). This low shrub is a principal browse plant for domestic livestock on the spring ranges of western and southern Utah.

*Artemisia tridentata* Nutt. Big or Common Sagebrush. Shrubs 4–20 (30) dm tall; branches spreading to erect, the vegetative branchlets 0.5–2 dm long; flowering stems mostly 1.5–4 dm long, usually much surpassing the vegetative ones; leaves 0.5–5 cm long, 3- to 5-toothed apically, or the upper ones entire, long-cuneate; inflorescence panicle, 3–20 (15) cm wide; involucre 3–5 mm long, 2–4 mm wide, the bracts 10–20, green, canescent, the margins scarious; flowers 3–8, all perfect, the corollas cream colored, glandular; receptacle and achenes glabrous. Three more or less completely intergrading varieties are known from Utah; they tend to occupy distinctive habitats, but

intermediates form wherever they meet. Further, this taxon is known to hybridize with most if not all other members of the section *Tridentatae*. The help of Durrant MacArthur and Sherel Goodrich of the U.S. Forest Service is here gratefully acknowledged. They

sorted our materials into their respective varieties following my initial attempt and general failure. While it is not possible to segregate all specimens, the following key will prove useful to those who must manage the sagebrush lands of Utah and the west.

1. Vegetative stems short, standing at about the same height, the inflorescence rather uniformly overtopping them; plants of middle and higher elevations ..... *A. tridentata* var. *vaseyana*
- Vegetative stems short to long, the inflorescence not uniformly overtopping them; plants of low to moderate elevations ..... 2
- 2(1). Leaves mainly to 2 cm long or more, narrowly cuneate; plants of low to moderate elevations ..... *A. tridentata* var. *tridentata*
- Leaves mainly less than 1.2 cm long, cuneate to cuneate-flabellate; plants mainly of moderate elevations, in drier sites ..... *A. tridentata* var. *wyomingensis*

**Var. *tridentata*** Big Sagebrush. Sagebrush, juniper, pinyon-juniper, and rabbitbrush communities at 1220 to 2410 m in most, if not all, Utah counties; Washington to Montana, south to California, Arizona, and New Mexico; 57 (xviii).

**Var. *vaseyana*** (Rydb.) B. Boi. Vasey Sagebrush. [*A. tridentata* ssp. *vaseyana* (Rydb.) Beetle]. Sagebrush, rabbitbrush, mountain brush, pinyon-juniper, aspen, Douglas fir, ponderosa pine, and spruce-fir communities at 1830 to 3050 m in all, or nearly all, Utah counties; Idaho to the Dakotas, south to Colorado; 55 (viii).

**Var. *wyomingensis*** (Beetle & Young) Welsh stat. nov. [based on *Artemisia tridentata* ssp. *wyomingensis* Beetle & Young Rhodora 67: 405. 1965]. Wyoming Sagebrush. Shadscale, rabbitbrush, sagebrush, juniper, bitterbrush, and mountain mahogany communities at 1525 to 1980 m in Box Elder, Garfield, Emery, Rich, Tooele, and Uintah counties; Wyoming and Idaho to Colorado. This is the sagebrush of drier sites at middle elevations. Its distribution is poorly understood; likely it is widespread. Its recognition allows management considerations by professionals in the various state and federal agencies; 9 (0).

***Artemisia tripartita*** Rydb. Threetip Sagebrush. Shrubs 2–20 dm tall, the branches erect, the vegetative ones 0.3–1.5 dm long, the flowering stems 0.6–3.5 dm long; leaves 1–4 cm long, deeply 3-cleft, the linear lobes

0.5–0.8 mm wide, canescent, the lobes sometimes again divided, or the upper ones entire; inflorescence paniculate, commonly 2–5 cm wide; involucre campanulate, 3–4 mm long, 1.5–4 mm wide; bracts many, imbricate, canescent and more or less green, the inner with broad brownish scarious margins; flowers 4–8, all perfect, the corollas stramineous to cream-colored, more or less glandular; achenes and receptacle glabrous. Sagebrush and mountain brush communities at ca 1525 to 1830 m in Box Elder and Cache counties; British Columbia to Montana, south to California and Colorado; 1 (0).

#### ASTER L.

Annual or perennial herbs from rhizomes (suffrutescent in *A. spinosus*), with watery juice; stems decumbent to ascending or erect, simple or branched; leaves alternate, simple, entire or toothed; heads solitary or few to several in corymbose clusters; involucre bracts strongly imbricate to subequal (or the outer surpassing the inner), herbaceous throughout, or with scarious margins near the base; receptacle flat or merely convex, naked; rays blue, purple, pink, or white, few to numerous, pistillate; disk flowers numerous, perfect, fertile, yellow or tinged reddish or purplish; pappus of capillary bristles; style branches flattened, oblong to lanceolate, mostly more than 0.5 mm long; achenes mostly several nerved.



1. Plants suffrutescent, rushlike, armed with axillary or subaxillary thorns, from a deep-seated rhizome; known from Garfield County (possibly Washington also) ..... *A. spinosus*
- Plants herbaceous, annual or perennial, unarmed, from a taproot or rhizome; distribution various ..... 2
- 2(1). Plants annual, from taproots ..... 3
- Plants perennial, from rhizomes or subrhizomatous caudices, or from branching caudices ..... 4
- 3(2). Involucral bracts definitely acute; rays wanting or nearly so, the pistillate corollas tubular, shorter than the style ..... *A. brachyactis*
- Involucral bracts obtuse to obtusish; rays to 2 mm long, longer than the style ...  
..... *A. frondosus*
- 4(2). Plants with a well developed caudex; involucral bracts reflexed, at least the outer; plants of rock crevices in the Wasatch and Canyon mountains ..... *A. kingii*
- Plants with caudex lacking or poorly developed, rhizomatous; involucral bracts not reflexed; plants of various habitats and localities ..... 5
- 5(4). Leaves all erect-ascending, thickened, to about 4 mm wide; pappus double, the outer series of very short bristles; heads solitary; plants known from Box Elder County ..... *A. scopulorum*
- Leaves various, seldom as above; pappus in one series, or rarely double; heads solitary to numerous; distribution various ..... 6
- 6(5). Involucral bracts dry, chartaceous, with scarious tips (at least the innermost), with a distinctive midvein, not herbaceous (the outer sometimes so) ..... 7
- Involucral bracts herbaceous at the tips or throughout, lacking a distinctive midvein ..... 9
- 7(6). Involucral bracts (at least the outer) bluntly obtuse apically; herbage strongly glaucous; plants often of open calcareous sites ..... *A. glaucodes*
- Involucral bracts acute; herbage green, not glaucous; plants of various habitats ..... 8
- 8(7). Rays white (drying pinkish); main leaves often over 20 mm wide; plants 6-15 dm tall, of montane areas in central northern Utah ..... *A. engelmannii*
- Rays purple or violet; leaves mainly less than 15 mm wide; plants 2-6 dm tall, of central northern and western Utah ..... *A. perelegans*
- 9(5). Involucres and peduncles glandular ..... 10
- Involucres and peduncles lacking glands or apparently so ..... 13
- 10(9). Stems glabrous; leaves linear to linear-oblongate, 2-5 mm wide, 1.5-7 cm long; plants of saline or hot water seeps and springs ..... *A. pauciflorus*
- Stems puberulent to villous with multicellular hairs, or glabrous, but, if so, differing in other respects ..... 11
- 11(10). Rays white; leaves glaucous; plants of central to south central Utah...*A. wasatchensis*
- Rays blue to purple, lavender, or violet ..... 12
- 12(11). Cauline leaves clasping the stem, mainly 15-40 mm wide; involucres 8-15 mm high; plants of central northern Utah ..... *A. integrifolius*
- Cauline leaves not or only slightly clasping, 2-10 mm wide; involucres 5-8 mm high ..... *A. campestris*

- 13(9). Pubescence occurring in decurrent lines below leaf bases, commonly not uniform below the heads, or only in the inflorescence; inflorescence often conic, mostly large and leafy ..... *A. hesperius*
- Pubescence of stem uniform, or, if in decurrent lines, uniform below the heads and confined to the inflorescence; inflorescence few to many flowered and not usually leafy to large and leafy (see also *A. eatonii*) ..... 14
- 14(13). Rays white; involuclral bracts strigulose dorsally (rarely glabrous), with spreading to squarrose minutely spinulose tips; heads numerous ..... 15
- Rays pink to purple, or less commonly white; involuclral bracts mucronate at the tip; heads few to numerous ..... 16
- 15(14). Rhizomes well developed, creeping; involuclres 4.6–6.5 mm high, 7–9.5 mm wide (when pressed); plants of western Utah ..... *A. falcatus*
- Rhizomes mainly poorly developed, or reduced and caudexlike; involuclres 3.8–4.9 mm high, 4.5–6 mm wide; plants of eastern Utah ..... *A. pansus*
- 16(14). Achenes glabrous or nearly so; herbage glabrous except for lines of puberulence in the inflorescence, tending to be glaucous; rare plants in southeastern Utah ..... *A. laevis*
- Achenes pubescent, except in some *A. foliaceus*; herbage pubescent to almost glabrous, scarcely glaucous ..... 17
- 17(16). Involuclral bracts strongly imbricate, the outer ones at least obtuse or obtusish (sometimes acute), not foliaceous; pubescence below the heads harsh ..... *A. chilensis*
- Involuclral bracts not strongly imbricate, or, if so, the bracts sharply acute, the outer ones acute, or, if obtuse, foliaceous; pubescence below heads soft or minute ..... 18
- 18(17). Inflorescence a long slender leafy panicle; heads numerous; stem pubescence short, uniform; leaves mostly more than 7 times longer than wide; rays usually pink to white ..... *A. eatonii*
- Inflorescence an open or congested panicle; heads solitary to several; pubescence various; rays usually blue to violet ..... 19
- 19(18). Involuclral bracts slender, never foliaceous; leaves at midstem mostly less than 1 cm wide, mostly over 7 times longer than broad ..... *A. occidentalis*
- Involuclral bracts various, but some of them usually enlarged and foliaceous; leaves at midstem mostly less than 7 times longer than broad ..... *A. foliaceus*

*Aster brachyactis* Blake in Tidestr. [*Tripolium angustum* Lindl. in Hook.; *A. angustus* (Lindl.) T. & G., not Nees; *Brachyactis angustus* (Lindl.) Britt. in Britt. & Brown]. Annual herbs, with taproots, glabrous throughout, except for leaf margins and involuclral bracts; stems 0.9–5.3 (7) dm tall; leaves 1.3–8 (12) cm long, 1–7 (9) mm wide, linear to narrowly oblong, entire, the lower ones soon deciduous; heads few to numerous, in paniculate to spicate inflorescences; involuclres 5.5–9.4 (11) mm high, 7–15 (17) mm wide, the bracts linear-oblong, acute to attenuate, herbaceous, subequal to somewhat imbricate, or some outer ones often surpassing the inner; marginal flowers pistillate, the corollas

tubular filiform, lacking rays, much shorter than the styles; pappus abundant, white, longer than the corollas. Sandbars, terraces, stream banks, marshes and pond margins, often where saline, in tamarix, rush, rabbitbrush, and cottonwood communities at 1220 to 1525 m in Box Elder, Carbon, Duchesne, Emery, Grand, Garfield, Salt Lake, Uintah, and Utah counties; British Columbia to Minnesota, south to Washington and Colorado; 14 (i).

*Aster campestris* Nutt. Meadow Aster. Perennial rhizomatous herbs, glandular, at least in inflorescence; stems puberulent to glabrous, mainly 1–5 dm tall; leaves 2–8 cm long, 2–8 mm wide, linear to oblong, entire,

sessile, sometimes clasping, the lower ones larger and more or less petiolate, or smaller, soon deciduous; heads solitary or several to many; involucre 5–8 mm high, glandular, the bracts subequal to definitely imbricate, acute or attenuate, with long herbaceous tips; rays 15–20, violet to purple, 6–12 mm long. Meadows at 1525 to 2475 m, reported for Utah (Univ. Washington Publ. Biol. 17(5): 77. 1955), but I have seen no specimens from the state.

***Aster chilensis* Nees** Pacific Aster. Perennial rhizomatous to subrhizomatous herbs, uniformly harshly strigose to strigulose, at least above; stems (0.8) 1.2–10.5 dm tall; leaves 0.6–16.5 cm long, 2–16 (20) mm wide, entire or nearly so, pubescent to glabrous, ciliate, the lower ones more or less petiolate, often deciduous at anthesis in taller plants, becoming smaller and sessile upwards, sometimes markedly reduced-bracteate in inflorescence; inflorescence of 1 to many heads, narrow, corymbose, or open paniculate; involucre 5–8 mm high, 6–15 mm broad, the bracts imbricate, green tipped (machaerantheroid), the chartaceous bases white to straw colored, the outer ones abruptly pointed but mucronate; rays commonly 15–40, purplish to violet (rarely white) or pink, 5–15 mm long; achenes pubescent. Alluvial fans, terraces, and slopes along stream and canal banks, in hanging gardens, rabbitbrush, sagebrush, grass-sedge, cottonwood-willow, ponderosa pine, juniper-pinyon, mountain brush, aspen, and spruce-fir communities at 850 to 3200 m in all Utah counties; Washington to Saskatchewan, south to California and New Mexico; 189 (xxviii). The Pacific aster is a generalized taxon with no clearly diagnostic features. It is separated from its near congeners by a group of intangible characteristics. Involucral bracts are definitely imbricate, with the greenish portion usually glabrous, and margins ciliate. The tips of outer bracts are often but not always obtuse, and the tip, even when abruptly contracted is mucronate. These features, which I designate as “machaerantheroid,” are shared to a greater or lesser extent with *A. eatonii*, *A. occidentalis*, and *A. foliaceus*. The harsh pubescence below the heads appears to be diagnostic, but is difficult to distinguish from the soft or merely puberulent vesture of closely related

species. Not all specimens can be assigned with certainty to any of the taxa. There are two intergrading morphological phases of the Pacific aster, which are striking in their extremes, but which probably represent nothing more than developmental gradients. There are plants with few flowers that lack distinctive reduced bracteate leaves in the inflorescence, and taller plants with more numerous heads and distinctively bracteate inflorescences. The inflorescences of the taller plants are mainly corymbiform, and not cylindroid as in *A. eatonii*. More work is indicated. Our material belongs to ssp. *adscendens* (Lindl.) Cronq.

***Aster eatonii* (Gray) Howell** Eaton Aster. [*A. foliaceus* var. *eatonii* Gray; *A. oregonus* authors, not (Nutt.) T. & G.]. Perennial rhizomatous to subrhizomatous herbs, uniformly puberulent, at least above (below the heads and sometimes on upper leaves), the stems (2.7) 6–10.5 dm tall, often reddish; leaves 0.8–15 cm long, 2–25 mm wide, entire or serrate, puberulent to glabrous, ciliate, the lowermost shortly petiolate, often deciduous in anthesis, becoming smaller and sessile upwards, linear to narrowly elliptic or lanceolate to oblanceolate; inflorescence of few to numerous heads, commonly open-cylindric to conic in form; involucre 4.5–8 (10) mm high, 6–10 mm wide, the bracts more or less subequal to indistinctly imbricate, green tipped (but not especially machaerantheroid), the chartaceous bases white to straw colored, all or most of them mucronate; rays 20–40, commonly pink (sometimes white), 5–12 mm long; achenes pubescent. Gravel bars, stream terraces, meadows, canal banks, hanging gardens, and marshes at 1370 to 2325 m in Cache, Garfield, Grand, Iron, Juab, Kane, Salt Lake, Summit, Uintah, Utah, Wasatch, and Washington counties; British Columbia to Saskatchewan, south to California, Arizona, and New Mexico; 48 (ix). The pink or white rays, uniform upper stem puberulence and leaves many times longer than broad are diagnostic for most specimens. Reports of *A. junciformis* Rydb. for Utah appear to be based on slender phases of the Eaton aster with linear leaves and slender rhizomes.

***Aster engelmannii* (D.C. Eaton) Gray** Engelmann Aster. [*A. elegans* var. *engelmannii* D.C. Eaton]. Perennial rhizomatous



or subrhizomatous herbs, puberulent to sparingly villous with multicellular hairs, or somewhat glandular, the stems 2–15.2 dm tall, reddish at the base; leaves 2–13.5 cm long, 3–46 mm wide, elliptic to lanceolate, entire (or nearly so), sparingly puberulent to glabrous or sparsely villous, sessile, largest near midstem, the lowermost reduced to scales; inflorescence of 1 to numerous large heads, corymbose or conic; involucre 8–13 mm high, 11–25 mm wide, the bracts mainly strongly imbricate, with a definite midvein, commonly purplish (at least the inner), the outer sometimes green and more or less foliaceous, sometimes all greenish or straw colored to the tip, glabrous dorsally, ciliate; rays 8–23, white (drying pinkish), 12–25 mm long; achenes pubescent. Mountain brush, juniper, Douglas fir, aspen, white fir, lodgepole pine, and spruce-fir communities at 1950 to 3200 m in Cache, Carbon, Davis, Duchesne, Juab, Salt Lake, Sanpete, Summit, Utah, and Wasatch counties; British Columbia and Alberta, south to Nevada and Colorado; 57 (vi).

*Aster falcatus* Lindl. [*A. multiflorus* var. *commutatus* T. & G.; *A. commutatus* (T. & G.) Gray]. Perennial rhizomatous herbs, villous or villous-hirsute with multicellular hairs, the stems 2.8–7.5 dm tall; leaves 1.2–6 (8) cm long, 2–8 mm wide, entire, antrorsely scaberulous on both surfaces (or glabrous), sessile, linear to narrowly oblong, often spinulose-mucronate, the lowermost often lacking at anthesis; inflorescences several- to many-headed, cylindroid; involucre 4.6–6.5 mm high, 7–9.5 mm wide, the bracts strongly to only somewhat imbricate, with a green tip, scaberulous to glabrous dorsally and ciliate; rays mainly 17–25, white (drying pale lavender in some), 6–8 mm long; achenes pubescent. Oak, sagebrush, and ponderosa pine communities at 1525 to 2135 m in Box Elder,

Kane, Utah, and Washington counties; Alaska to Minnesota, south to California, New Mexico, and Kansas; 7 (i). The species is closely allied to *A. pansus* (q.v.), which has smaller heads.

*Aster foliaceus* Lindl. in DC. Leafybract Aster. Perennial rhizomatous or subrhizomatous herbs, uniformly and shortly soft-villous below the heads, uniformly villous to glabrous below, or in lines below leaf bases, the stems 1.3–7 dm tall; leaves 1.8–16 cm long, 3–34 mm wide, entire or nearly so, strigose to glabrous, ciliate, the lower ones petiolate (often lacking at anthesis), becoming smaller and sessile (and more or less clasping) upwards; inflorescence of 1–19 (50) corymbosely arranged large and showy heads; involucre 6–12 mm high, 10–20 mm wide, the bracts imbricate to slightly so, foliaceous or slender, green with pale white to yellowish or brownish chartaceous bases (at least the inner), acute to obtuse or rounded, mucronate; rays mainly 15–50, pink to purple, blue, or violet, 9–16 (20) mm long; achenes hairy. The leafybract aster is a portion of an assemblage that includes the concept of *A. subspicatus* Nees. Both *A. foliaceus* and *A. subspicatus* were described from coastal Alaska (Unalaska and Yakutat Bay, respectively). Brownish bases of involucre bracts, commonly serrate leaves, and reddish pappus are supposedly diagnostic for *A. subspicatus*, which is not known from Utah, but some specimens of *A. foliaceus* have one or more of these features. In the Alaska Flora (Welsh 1974), I treated both species under the older name of *A. subspicatus*. Now, I follow tradition so as to avoid creation of synonyms should further study indicate a better course of action. Three more or less distinctive infraspecific taxa are present in Utah.

1. Involucre bracts foliaceous, 2–6 mm broad; plants uncommon ..... *A. foliaceus* var. *canbyi*
- Involucre bracts not especially foliaceous, mainly less than 2 (2.5 ) mm wide; plants common to uncommon ..... 2
- 2(1). Plants mainly 0.5–2.5 dm tall, decumbent or ascending; bracts often purple margined or tipped; known from high elevations, rare ..... *A. foliaceus* var. *apricus*
- Plants often more than 2 dm tall, erect; bracts seldom as above; known from low to high elevations, common ..... *A. foliaceus* var. *parryi*

**Var. *apricus*** Gray Meadows in spruce-fir forest at 3050 to 3660 m in Summit County; British Columbia to Montana, south to California and Colorado; 1 (0).

**Var. *canbyi*** Gray Mountain brush, aspen, and spruce-fir communities at 1950 to 2900 m in Iron, Juab and Salt Lake counties; Washington to Wyoming, south to California and New Mexico; 5 (0).

**Var. *parryi* (D.C. Eaton) Gray** [*A. adscendens* var. *parryi* D.C. Eaton; *A. foliaceus* var. *frondeus* Gray]. Meadows and openings in aspen, spruce, lodgepole pine, and Douglas fir communities at 1890 to 3265 m in Cache, Duchesne, Garfield, Iron, Juab, Piute, Salt Lake, Sanpete, Summit, Tooele, Uintah, and Utah counties; Washington to Wyoming, south to California and New Mexico; 36 (viii). This is the phase of the leafybract aster that simulates *A. occidentalis* (q.v.), but which seldom has long peduncles, dark blue-purple ray corollas, and much reduced upper stem leaves of that species.

***Aster frondosus* (Nutt.) T. & G.** Leafy Aster. [*Tripolium frondosum* Nutt.]. Annual herbs from taproots; stems 0.2–3.6 cm tall; leaves 1–6 cm long, 2–12 mm wide, linear to oblong or oblanceolate, entire, the lower ones sometimes deciduous; heads few to numerous, in a narrow panicate to spicate inflorescence; involucre 5–9 mm high, 6–13

mm wide, the bracts oblong to narrowly oblanceolate, obtuse or obtusish, herbaceous, subequal to moderately imbricate; marginal flowers pistillate, the rays developed, pink, to 2 mm long; pappus abundant, white, longer than the disk corollas. Lake shores, seep margins, wet meadows, and stream banks in saltgrass, tamarix, Russian olive, rabbitbrush, and greasewood communities at 1250 to 2270 m in Beaver, Duchesne, Garfield, Grand, Juab, Kane, Salt Lake, San Juan, Utah, and Wayne counties; Washington to Wyoming, south to California and New Mexico; 18 (ii).

***Aster glaucodes* Blake** Blueleaf Aster. Perennial rhizomatous herbs, glabrous and glaucous, or puberulent to glandular in the inflorescence; stems 1.1–7 dm tall; leaves 1.4–12.5 cm long, 4–25 mm wide, entire, lance-oblong to oblong or elliptic, glaucous, glabrous, sessile and clasping, the lower often lacking at anthesis, reduced upwards; heads few to numerous in corymbose inflorescences; involucre 6–9 mm tall, 7–9 mm wide, the bracts imbricate, dry, chartaceous throughout or sometimes some of them greenish, the midvein prominent, commonly suffused with pink or purple, mainly obtuse to less commonly acute apically; rays 10–20, white or pink, 11–17 mm long. There are two varieties within our specimens.

1. Peduncles and/or involucre glandular-pubescent; plants of Washington and adjacent western Kane counties ..... *A. glaucodes* var. *pulcher*
- Peduncles and involucre lacking glandular pubescence; plants widespread .....  
..... *A. glaucodes* var. *glaucodes*

**Var. *glaucodes*** This is the common phase of the species, often on calcareous substrates at higher elevations and in saline seeps at moderate to lower elevations in sagebrush, pinyon-juniper, mountain brush, ponderosa pine, ryegrass, spruce-fir, Douglas fir, lodgepole pine, and hanging garden communities at 1220 to 3050 m in Cache, Carbon, Duchesne, Emery, Garfield, Grand, Kane, San Juan, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Washington, and Wayne counties; Idaho and Wyoming, south to Arizona and Colorado; 56 (ix).

**Var. *pulcher* (Blake) Kearney & Peebles**  
**Note:** This taxon was published at subspecific

rank by Blake, and was inadvertently accepted at varietal rank by Kearney and Peebles (Arizona Flora 872. 1951), without citation of the basionym, *A. glaucodes* ssp. *pulcher* Blake, Proc. Biol. Soc. Washington 35: 174. 1922. Salt desert shrub, sagebrush, pinyon-juniper, and ponderosa pine communities at 825 to 2136 m in Washington and adjacent western Kane counties; Arizona; 6 (0).

***Aster hesperius* Gray** Siskiyou Aster. [*A. laetivirens* Greene]. Perennial rhizomatous herbs, villous with multicellular hairs in decurrent lines from leaf bases, or less commonly almost glabrous and with decurrent lines below the heads; stems 3.6–9.5 (15) dm

tall; leaves 3–17 (21) cm long, 5–27 mm wide, entire or serrate, glabrous or scabrous, ciliate, the lower ones commonly petiolate, often deciduous at anthesis, becoming smaller, sessile and more or less clasping upwards, sometimes much reduced in inflorescence; heads few to numerous in open to narrow subcorymbose inflorescences; involucre 4.5–7 (8) mm high, 7–12 mm wide, the bracts imbricate to subequal, green tipped, the chartaceous base white to straw colored, all acute and mucronate; rays commonly 20–50, pink to blue or white, 6–14 mm long; achenes hairy. Wet meadows, canal banks, and stream sides with sedges, rabbitbrush, willow, and other riparian communities at 850 to 2135 m in Box Elder, Cache, Duchesne, Garfield, Grand, Kane, Millard, Summit, Utah, Wasatch, and Washington counties; Alberta to Saskatchewan, south to California, Arizona, New Mexico, and Missouri; 32 (vii). This plant occurs at lower elevations in Utah and has been confused with *A. foliaceus*, with which some plants share the subequal bracts. It has also been mistaken for *A. chilensis*, with which it is partially sympatric. The lack of uniformly disposed hair in the inflorescence appears to be diagnostic.

*Aster integrifolius* Nutt. Thickstem Aster. Perennial subrhizomatous herbs, glandular villous with multicellular hairs, at least above; stems 2.3–6.4 (7) dm tall; leaves 2.5–19 cm long, 8–50 mm wide, entire, oblanceolate to elliptic or lanceolate, glandular-villous, ciliate, the lower ones petiolate, becoming smaller, sessile and clasping upward; heads few to several (numerous), large and showy, in elongate to subcorymbose clusters; involucre 8–13 (14) mm high, 12–23 mm wide, the bracts mainly subequal, green or suffused with purple, glandular dorsally, foliaceous or not; rays commonly 10–25, dark purple, 10–15 mm long. Meadows and moist woods in sedge-willow, sagebrush, Douglas fir, and spruce communities at 2275 to 3125 m in Rich, Salt Lake, Summit, and Wasatch counties; Washington and Montana, south to California and Colorado; 8 (0).

*Aster kingii* D.C. Eaton [*Machaeranthera kingii* (D.C. Eaton) Cronq. & Keck]. Perennial herbs from a caudex and taproot, the caudex branches clothed with blackish or dark brown marcescent leaf bases, these

scarious and ashy when young; stems 3–12 (15) cm long, more or less villous below, stipitate-glandular above; basal leaves 0.8–12 cm long, 3–22 mm wide, petiolate, the petiole bases expanded and scarious, the blades oblanceolate or spatulate, glabrous or glandular, or less commonly hispidulous or merely puberulent on one or both sides; heads 1–5, racemously or corymbosely arranged; involucre 8–11 mm high, 10–16 mm wide; bracts glandular to shortly stipitate-glandular, herbaceous above the middle, scarious below, often suffused purplish, especially the inner, the tips of at least the outer reflexed; rays 15–27, white (often fading pale pink), 8–17 mm long, 1.5–2.8 mm wide; achenes ca 3.5 mm long. Douglas fir-white fir, mountain brush, and cottonwood communities at 1839 to 3050 m in Juab, Millard, Salt Lake, and Utah counties; endemic; 21 (i). The southern populations have at least some toothed leaves and stems with longer stipitate-glandular hairs; they belong to var. *barnebyana* (Welsh & Goodrich) Welsh comb. nov. [based on: *Machaeranthera kingii* var. *barnebyana* Welsh & Goodrich Brittonia 33: 299. 1981]; 6 (0). Attempts to segregate genera within the Astereae are often fraught with difficulties. This is especially true of that core of genera involving *Haplopappus*, *Machaeranthera*, *Xylorhiza*, and *Aster*. Cronquist and Keck (1957. Brittonia 9: 231–329) reconstituted the genus *Machaeranthera*, and included within that expanded generic definition those species treated elsewhere herein as *Machaeranthera* and *Xylorhiza*. Included within the series Integrifoliae of section *Xylorhiza* was *Aster kingii*. Watson (1978. Madrono 25: 205–210) has shown the chromosome number to be  $2n=18$  for *Aster kingii*, and he notes that its placement within *Machaeranthera* section *Xylorhiza* “is phenologically, ecologically, morphologically, and chromosomally anomalous. . .” The chromosome numbers reported for *Xylorhiza* are  $2n=12$  or  $24$ ; that of *Machaeranthera*, in a restricted sense, is  $2n=8, 10$ , or  $16$ ; that of *Aster* is mainly  $2n=18$ . The taproots and squarrose involucre bracts suggest an alliance with *Machaeranthera*, shorn of *Xylorhiza*, but the similarity seems superficial, especially in light of different chromosome numbers. Some asters in a strict sense, i.e.,



*A. alpigenus* Rydb., have a caudex, with the rhizome attenuated. The logical conclusion of such an attenuation is the caudex of *A. kingii*, and the squarrose bracts seem to have been secondarily derived, being present to a greater or lesser degree in other *Aster* species as well as in *Machaeranthera*. Hence, it seems best to treat this taxon within *Aster*.

*Aster laevis* L. Smooth Aster. Subrhizomatous perennial herbs, glabrous or nearly so; stems mainly 5–12 dm tall; leaves 0.8–14 cm long, 2–30 mm wide, entire or serrate, linear-subulate to lanceolate or elliptic, the lower ones petiolate, often lacking at anthesis, becoming smaller, sessile, and more or less clasping upwards; heads numerous, in corymbose inflorescences; involucre 5–8 mm high, 7–12 mm broad (when pressed), the bracts slender, green tipped, the chartaceous bases straw colored to brownish or white, acute and mucronate; rays 15–30, blue or purple, 6–9 mm long; achenes glabrous. Riparian communities at ca 1400 m in Grand (and San Juan?) County; Yukon to Maine, south to Oregon, New Mexico, and Georgia; 1 (i). This plant is rare in collections from Utah, due presumably to the paucity of late season collections from southeastern Utah.

*Aster occidentalis* (Nutt.) T. & G. Western Aster. [*Tripolium occidentale* Nutt.]. Rhizomatous or subrhizomatous perennial herbs, uniformly, softly, and often loosely villous (at least above); stems 0.9–8.5 dm tall; leaves 1–15 cm long, 1–20 mm wide, entire or toothed, glabrous or nearly so, ciliate, the lower ones petiolate, sometimes lacking at anthesis, rather abruptly smaller and finally sessile upwards; inflorescence mainly of 1–7 (rarely to 15), corymbosely arranged large and showy heads; involucre 5–12 mm high, 7–20 mm wide, the bracts imbricate to subequal, slender, green, with pale yellowish to white or brownish chartaceous bases (at least the inner), mainly acute, mucronate; rays 20–50, blue to purple, 6–15 mm long; achenes hairy. Meadows and stream sides in lodgepole pine, cottonwood, willow, aspen, and spruce-fir communities at 2175 to 3175 m in Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Piute, Sanpete, Sevier, Summit, and Wasatch counties; Mackenzie to Colorado and California; 43 (ix). This species

shares the features of soft loose pubescence and general aspect with the partially sympatric *A. foliaceus*. The very slender and abruptly reduced cauline leaves are diagnostic in most instances.

*Aster pansus* (Blake) Cronq. Elongate Aster. Subrhizomatous herbs, villous or villous-hirsute with multicellular hairs, the stems 3–12 (or more) dm tall; leaves 1–6 cm long, 2–8 mm wide, entire, antrorsely scaberulous on both surfaces, sessile, linear to narrowly oblong, often spinulose-mucronate, the lowermost commonly lacking at anthesis; inflorescence paniculate to secund-paniculate, narrow; involucre 3.8–4.9 mm high, 4.5–6 mm wide, the bracts strongly imbricate, green tipped, scaberulous dorsally and ciliate; rays mainly 15–25, white, 3–8 mm long; achenes hairy. Drainages, meadows, seeps, and hanging gardens at 1220 to 1890 m in Daggett, Grand, San Juan, and Uintah counties; British Columbia to Montana, south to Colorado and Nebraska; 6 (iv). This species forms the basis for inclusion in previous botanical works of the name *A. ericoides* L. in the Utah flora. It is closely allied to *A. falcatus*, but differs in the smaller heads, taller stature, and eastern distribution.

*Aster pauciflorus* Nutt. Alkali Aster. [*A. thermalis* Jones, type from Monroe Hot Springs]. Subrhizomatous perennial herbs, glabrous below, stipitate-glandular above and in inflorescence; stems 2–7.5 dm tall; leaves 1.1–12.5 cm long, 1–4 mm wide, entire, acicular to lance-linear or linear, glaucous, glabrous, all sessile or the lowermost petiolate, reduced upwards; heads few to several in corymbose inflorescences; involucre 4.3–7 mm long, 7–10 mm wide, the bracts imbricate to subequal, glandular dorsally, green throughout, narrow and acute; rays mainly 20–35, blue to purple, 5–12 mm long; achenes hairy. Hot springs, stream terraces, and salt grass meadows, often in saline or alkaline substrates at 1300 to 2135 m in Box Elder, Duchesne, Emery, Juab, Kane, Millard, Sanpete, Sevier, Salt Lake, and Utah counties; Saskatchewan to Nevada, Arizona, and Mexico. This distinctive glandular aster has been collected in full anthesis on 27 April growing in hot water at Monroe Hot Springs in Sevier County. It continues to flower into October; 21 (vi).

*Aster perelegans* Nels. & Macbr. Nuttall Aster. [*Eucephalus elegans* Nutt.; *A. elegans* (Nutt.) T. & G., not Willd.]. Subrhizomatous perennial herb, puberulent to glabrate (sometimes glandular); stems 3–7 dm tall; leaves 1.3–6.5 cm long, 3–14 mm wide, entire, oblong to oblong-lanceolate or elliptic, scabrous, firm, sessile, the lowermost reduced in size; heads 3–16, in corymbose inflorescences; involucre 7–10 mm high, 7–12 mm wide, the bracts chartaceous, imbricate, with prominent midvein, and acute to obtuse apex, the margins hyaline and ciliate, more or less puberulent dorsally; rays 5–16, dark purple, 7–13 mm long; achenes hairy. Sagebrush, mountain brush, Douglas fir, aspen, and limber pine communities at 1725 to 3050 m in Carbon, Duchesne, Juab, Millard, Salt Lake, Wasatch, and Weber counties; Oregon to Montana, south to Nevada; 21 (iv).

*Aster scopulorum* Gray Crag Aster. [*Chrysopsis alpina* Nutt., not *A. alpinus* L.]. Perennial subrhizomatous herbs with a woody caudex, villous on stems and peduncles; stems 4–12 cm tall; leaves 5–12 (15) mm long, 1–3 mm wide, overlapping, elliptic to oblong or linear, firm, scabrous or puberulent, often with some villous hairs above, spinulose-mucronate; heads solitary, pedunculate; involucre 7–11 mm high, 8–12 mm wide, the bracts imbricate, sparingly villous-hirsute and glandular, with a prominent midvein in the lower half, greenish, with chartaceous border and hyaline margins, acute; rays mainly 8–15, blue or purplish, 6–15 mm long; achenes hairy. Sagebrush community at 2440 to 2745 m in Box Elder County; Oregon to Montana, south to California and Nevada; 8 (0).

*Aster spinosus* Benth. Mexican Devilweed. Suffrutescent, rushlike plants from a deeply placed rhizome, glabrous; stems 6–12 (or more) dm tall, with axillary or supraxillary thorns to 1.5 cm long; leaves 2–4 cm long, 2–5 mm wide, firm, entire to toothed, reduced above to scales; heads solitary at ends of branches, or some axillary; involucre 4–6 mm high, 6–8 mm wide, the bracts imbricate, slender, acute to acuminate, green, with prominent scarious margin; rays 15–30, white, very short; achenes glabrous. Riparian communities at below 1130 m in Garfield and probably Washington counties; California to Texas, south to Central America; 1 (0).

The plant was collected at the mouth of Ticcaboo Canyon, along the Colorado River in Glen Canyon (Lindsay 20, 1958 UT), at a site now inundated by Lake Powell. This is one of a series of extirpations related to construction of Glen Canyon Dam. The plant should be sought in the St. George vicinity.

*Aster wasatchensis* (Jones) Blake Markagunt Aster. Subrhizomatous perennial, glandular-puberulent; stems 3.5–6.5 dm tall; leaves 1.8–8.5 cm long, 6–24 mm wide, entire, lanceolate to oblong, or oblanceolate, glandular-puberulent to glabrous, firm, more or less glaucous, the lowermost often smaller and commonly lacking at anthesis; heads several to numerous, more or less corymbosely arranged; involucre 8–11.5 mm long, 10–20 mm wide, the bracts herbaceous throughout or the inner with scarious bases, glandular dorsally, abruptly acute to attenuate, apically; rays 15–25, white or pink, 10–20 mm long; achenes hairy. Pinyon-juniper, aspen, limber pine, and spruce-fir communities at 1890 to 3050 m in Garfield, Iron, Millard, and Piute counties; endemic. This remarkable aster is unique in Utah in having foliaceous or subfoliaceous glandular involucre bracts and glaucous leaves; 14 (vi).

#### ATRICHOSERIS Gray

Annual scapose herbs, with milky juice, from taproots; leaves all basal, sinuate-dentate, often spotted; heads on slender peduncles, few to numerous, corymbosely arranged; involucre of about 12–15 subequal but biseriate, lance-linear scarious-margined bracts and some shorter outer bracts; receptacle naked; corollas all raylike, perfect, white; pappus lacking; achenes oblong, with corky-thickened ribs.

*Atrichoseris platyphylla* Gray Tobacco-weed; Gravel Ghost. Plants 3–10 dm tall (or more), from slender taproots; leaves 1.2–10.5 cm long, 0.5–6 cm wide, obovate to broadly spatulate, tapering abruptly to a broad petiole, sinuate-dentate, the teeth mucronate-cuspidate, glabrous, often mottled, more or less glaucous; involucre 6–8 mm high, 12–16 mm wide, the outer bracts ovate-lanceolate, hyaline, more or less scurfy, the inner ones lance-acuminate, with broad hyaline margins;

corollas white, 8–20 mm long; achenes white, with corky ridges. Joshua tree, ambrosia, yucca, cholla communities at 670 to 750 m in Washington County; California and Arizona; 4 (i).

BACCHARIS L.

Dioecious shrubs; leaves alternate, entire or toothed; heads discoid, many flowered, the

corollas white, turbinate, borne in corymbose or paniculate clusters; involucre imbricate, the bracts chartaceous, whitish; pistillate heads with tubular-filiform obscurely toothed or truncate corollas, the pappus of copious capillary bristles; staminate heads of tubular 5-toothed corollas, the pappus (often scanty) of usually twisted clavellate scales; receptacle naked; style branches flattened; achenes subcylindric, 5- to 10-ribbed.

1. Branches fastigiate, deeply sulcate and more or less ridged, the leaves commonly deciduous at anthesis; achenes 10-ribbed ..... 2
- Branches not especially fastigiate, commonly spreading to ascending; leaves commonly persistent at flowering time; achenes 5- or 10-ribbed ..... 3
- 2(1). Main leaves linear; pistillate pappus to 10 mm long or more in fruit ... *B. sarothroides*
- Main leaves obovate-spatulate; pistillate pappus to 3 mm long in fruit...*B. sergilloides*
- 3(1). Leaves long-cuneate basally, thickened, entire or few toothed toward apex; branches often subfastigiate; achenes 10-nerved; plants of Virgin and Colorado drainages ..... 4
- Leaves not especially long-cuneate basally, commonly thin, entire, or toothed from below the middle; achenes 5-nerved ..... 5
- 4(3). Staminate involucre 3.5–5.3 mm long, 3.7–4.8 mm wide; pistillate involucre 7.3–8.5 mm long; pappus 11–13 mm long; plants of Washington and Kane counties ..... *B. emoryi*
- Staminate involucre 5.3–6 mm long, 5–10 mm wide; pistillate involucre 6–6.5 mm long; pappus 8–9.5 mm long; plants of Emery, Grand, Garfield, and San Juan counties ..... *B. salicina*
- 5(3). Leaves mainly entire; panicles terminating short lateral branches; plants of Washington County ..... *B. viminea*
- Leaves usually serrate; panicles terminating main stems; plants of Washington and Kane counties ..... *B. glutinosa*

*Baccharis emoryi* Gray in Torr. Shrubs, mainly 1–2 (3) m tall, the branches green to olive or brownish, ascending, subfastigiate, more or less glutinous; leaves 1.2–8.5 cm long, 3–20 mm wide, spatulate-oblongate to elliptic or linear, cuneate to a slender petiole, thick, entire or sparingly and irregularly toothed, obtuse to acute apically; heads numerous in a conic to pyramidal panicle; pistillate involucre 7.3–8.3 mm high, 4.5–7 mm wide, the bracts in several series, scarious, often glutinous, with thickened green or brown to reddish tips and hyaline margins; staminate involucre 3.7–5.3 mm high, 3.7–4.8 mm wide; pistillate corollas 4.5–5.5 mm long, the pappus 11–13 mm long; achenes 10-ribbed. Stream and canal banks and hanging gar-

dens at 825 to 1220 m in Kane and Washington counties; Arizona, Texas, and California; Mexico; 19 (iv).  
*Baccharis glutinosa* Pers. Shrubs, mainly 1–3 m tall, the branches straw colored to brownish or greenish, ascending-spreading, not fastigiate, glutinous; leaves 1.2–12.5 (15) cm long, 4–18 mm wide, elliptic to narrowly lanceolate, acuminate to attenuate, cuneate to a short petiole, evenly serrate to entire; heads numerous in terminal cymose panicles (less commonly in lateral ones) with pistillate and staminate heads about the same size; involucre 3.5–4.5 mm high, 4–5.5 (7.5) mm wide; corollas 2.2–3 mm long, the pistillate pappus 3.5–4.5 mm long; involucral bracts in several series, chartaceous, greenish in the



center, the margins scarious, not glutinous; achenes 5-ribbed. Stream bars and banks, and in seeps, at 670 to 1130 m in Kane and Washington counties; Colorado and Nevada to Texas and California; South America; 6 (ii).

***Baccharis salicina* T. & G.** Shrubs, mainly 1.5–3 m tall, the branches green to brownish, subfastigiate, glutinous; leaves 1.4–8 cm long, 4–18 mm wide, elliptic to oblanceolate or linear, cuneate to a short petiole, thick or thin, entire or sparingly toothed or lobed mainly near the apex, acute to rounded apically; heads few to numerous in axillary and/or terminal panicles; pistillate involucre 6–6.5 mm high, 4–6 mm wide, the bracts in several series, scarious, often glutinous, with thickened greenish to reddish tips and hyaline margins; staminate involucre 5.3–6 mm high, 5–10 mm wide; pistillate corollas 2.5–3.5 mm long, the pappus 8–10 mm long; achenes 10-ribbed. Stream banks and hanging gardens at 1220 to 1525 m in Emery, Garfield, Grand, and San Juan counties; Colorado to Kansas, south to New Mexico and Texas; 7 (iv). Our material of *B. salicina* has long been mistaken for *B. emoryi*, to which it is allied. The shorter pistillate involucre and broader staminate involucre are diagnostic.

***Baccharis sarothroides* Gray** Broom Baccharis. Shrubs, mainly 1–3 m tall, the branches green to brown, fastigiate, glutinous, finally almost leafless; leaves 1–3.5 cm long, 2–5 mm wide, linear to oblong, entire, ridged; heads solitary at tips of fastigiate branches forming a hemispheric panicle; pistillate involucre 6–8 mm high, 5–10 mm wide, the bracts in several series, cream colored; staminate involucre 3–4 mm high, 4–8 mm wide, the bracts green apically; pappus 6–11 mm long; achenes 10-ribbed. Reported for Washington County (UT), where presumably it occurs along streams; California to New Mexico; 0 (0).

***Baccharis sergiloides* Gray** Squaw Waterweed. Shrubs, mainly 0.3–2 m tall, the branches green to brown, fastigiate, glutinous, finally almost leafless; leaves 0.5–2.5 cm long, 1–10 mm wide, spatulate to obovate, entire or few toothed, thick; heads numerous, borne in conic to pyramidal panicles; involucre 2.5–3.5 mm high, 2.5–3.5 mm wide, the bracts in several series, straw colored, or with thickened brownish centers; pappus 2.5–3 mm long; achenes 10-ribbed.

Stream bars and banks at 670 to 825 m in Washington County; California and Arizona; 3 (i).

***Baccharis viminea* DC.** Mule-fat. Shrubs, mainly 2–3 m tall, the branches green to straw colored or brownish, spreading-ascending, not fastigiate, glutinous; leaves 0.8–9.5 cm long, 2–9 mm wide, elliptic to lance-elliptic or narrowly oblong, attenuate to acute, cuneate to a short petiole, entire to evenly serrate; heads few to many in terminal cymose panicles on short lateral branches, with pistillate and staminate heads about the same size; involucre 3–5.7 mm high, 6–9 mm wide; corollas 2.5–3.8 mm long; pistillate pappus 5–6 mm long; involucral bracts in several series, chartaceous, commonly with reddish centers, the margins scarious, not glutinous; achenes 5-ribbed. Stream bars and banks at 650 to 900 m in Washington County; California and Arizona; 10 (ii).

#### BAHIA Lag.

Biennial or short-lived perennial herbs with watery juice, arising from taproots; stems erect or ascending, puberulent; leaves alternate, once to twice ternately divided; heads few to numerous, in corymbose panicles; involucral bracts subequal, in 1 or 2 series, greenish; ray flowers present, yellow, pistillate, fertile; disk flowers perfect, fertile; pappus none; style branches flattened; achenes 4-angled, 12-nerved.

***Bahia dissecta* (Gray) Britt.** [*Amauria dissecta* Gray]. Biennial or short-lived perennial herbs, the stems 2–8 dm tall, minutely puberulent; leaves 1–10 cm long, the blade 1- to 3-ternately divided, oval to cordate in outline, strigulose; peduncles glandular hairy; involucre hemispheric, 3.4–6 mm high, 8–12 mm wide, the bracts more or less glandular hairy (or merely villous), greenish, abruptly contracted to a broadened apex; rays mainly 10–15, yellow, 4.5–9 mm long; achenes glabrous. Sagebrush, pinyon-juniper, mountain brush, aspen, lodgepole pine, ponderosa pine, and spruce communities at 1700 to 2930 m in Beaver, Garfield, Grand, Kane, Sevier, Uintah, Washington, and Wayne counties; Nevada to Wyoming, south to California, Arizona, and Mexico; 24 (iii). Those species treated elsewhere in this work as *Platyschukhria* belong to *Bahia* in a broad sense

and are probably best treated in the latter genus, but their combination is not implied here.

BAILEYA Harv. & Gray

Annual, biennial, or perennial herbs from taproots, with watery juice; stem erect,

white-tomentose; leaves alternate, 1- or 2-pinnatifid to entire; heads solitary or few in cymose clusters; involucre bracts subequal, white-tomentose; receptacle naked; ray flowers persistent, yellow, pistillate, fertile; disk flowers perfect, fertile; pappus none; style branches short, truncate; achenes oblong or clavate, striate.

1. Ray flowers 7 or fewer; plants slender annuals with involucre less than 8 mm wide ..... *B. pauciradiata*
- Ray flowers 20 or more; plants annual, biennial, or perennial, with involucre 10–26 mm wide ..... 2
- 2(1). Rays 11–22 mm long; peduncles (4.5) 12–32 cm long in anthesis; involucre 5.7–7.5 mm high, 13–26 mm wide ..... *B. multiradiata*
- Rays 8–10 mm long; peduncles 1–8 (11) cm long in anthesis; involucre 3–5.5 mm high, 10–16 mm wide ..... *B. pleniradiata*

*Baileya multiradiata* Harv. & Gray Biennial or short-lived perennial herbs; stems 1.9–5 (5.2) dm tall, white-tomentose; leaves 0.8–10 cm long, the blade 1- to 2-pinnately lobed to entire, ovate-oval to linear, white-tomentose; peduncles (4.5) 13–32 cm long in anthesis, white-tomentose; involucre 5–7.5 mm high, 13–26 mm wide, the bracts slender, greenish, white-tomentose; rays 25–40 or more, yellow, 11–22 mm long; achenes glabrous. Creosote bush, Joshua tree, burrobush, blackbrush, and sagebrush communities at 670 to 1320 m in western Kane and Washington counties; Nevada and California south to Mexico; 36 (iii).

*Baileya pauciradiata* Harv. & Gray Annual herbs; stems mainly 1.5–4 (6) dm tall, densely floccose-lanate; leaves 3–10 cm long, the blades entire or the lower irregularly pinnatifid (or bipinnatifid), linear or linear-lanceolate, white-tomentose; peduncles 2–5 cm long in anthesis, tomentose; involucre 5–6 mm high, 5–8 mm broad, the bracts slender, greenish, loosely tomentose; rays 5–7, yellow, 5–8 mm long; achenes glabrous. Reported from Washington County by Meyer (1976), where it was collected at Warner Valley Spring; California, Arizona, and Mexico; 0 (0).

*Baileya pleniradiata* Harv. & Gray Annual to short-lived perennial herbs; stems

0.8–5 dm tall, white-tomentose; leaves 0.8–12 cm long, the blades 1- to 2-pinnately lobed to entire, obovate to linear, white-tomentose; peduncles 1–8 (11) cm long in anthesis, white-tomentose; involucre 3.5–5.5 mm high, 6–13 mm wide, the bracts slender, greenish, white-tomentose; rays 18–58, yellow, 8–10 mm long; achenes glabrous. Creosote bush, blackbrush, shadscale, mesquite, sagebrush, and pinyon-juniper communities at 820 to 1100 m in Washington County; Nevada and California to Texas; Mexico; 29 (ii).

BALSAMORHIZA Nutt.

Perennial scapose or subscapose herbs from taproots, the juice watery; leaves mainly basal, simple and entire or variously pinnatifid, reduced and bractlike upward; heads solitary, or few to several; involucre bracts in several series, imbricate or subequal, herbaceous; receptacle chaffy, convex, the bracts enclosing the achenes; ray flowers present, pistillate, fertile, usually yellow; disk flowers numerous, perfect, fertile, yellow; pappus none; style branches slender; achenes compressed. **Note:** The genus is notorious for the lack of genetic barriers to hybridization. Any two taxa can intergrade where they occur together.

1. Leaves sagittate, with entire margins ..... *B. sagittata*
- Leaves pinnatifid or variously cleft ..... 2

- 2(1).      Leaves mainly 3–6 dm long, with segments mainly 5–12 cm long, these entire or few lobed or toothed ..... *B. macrophylla*
- Leaves mainly 1–3 dm long, with segments mostly 1–5 cm long, these entire or variously lobed or toothed ..... 3
  
- 3(2).      Involucral bracts abruptly tapering to a long-attenuate apex; stem leaves relatively well developed, pinnatifid or bipinnatifid; reported for northern Utah, but no specimens have been seen ..... *B. hirsuta* Nutt.
- Involucral bracts gradually tapering to an attenuate apex; stem leaves lacking or small and inconspicuous ..... *B. hookeri*

*Balsamorhiza hookeri* Nutt. Hooker Balsamroot. Perennial scapose herbs from a thick taproot, mainly 0.9–4.5 (5.2) dm tall; leaves 6–30 cm long, (0.3) 1.5–11 cm wide, pinnatifid or bipinnatifid, the segments to 5.5 cm long; peduncles naked or with a few inconspicuous, linear, entire or pinnatifid bracts near the base; heads solitary; involucre 13–24 mm high, 21–47 mm wide,

the bracts lance-linear, evenly tapering to the apex or somewhat enlarged at the base, long-ciliate, glandular to tomentose dorsally; rays mainly 10–16, yellow, 16–40 mm long; achenes glabrous. Phases of this taxon are known to form intermediates with *B. sagittata*, and presumably with *B. macrophyllum*. Ours are separable into two modestly distinctive varieties.

- 1.        Involucres densely villous-tomentose dorsally; plants of Daggett, Duchesne, and Uintah counties ..... *B. hookeri* var. *neglecta*
- Involucres glandular to glabrous dorsally; plants of broad distribution, occasionally of Daggett and Duchesne counties ..... *B. hookeri* var. *hispidula*

**Var. *hispidula* (Sharp) Cronq.** [*B. hispidula* Sharp]. This is the common phase of the species in Utah, and it has been confused with *B. hirsuta* Nutt., with which it is compared in the key. Bunchgrass, sagebrush, mountain brush, juniper, pinyon-juniper, and salt desert shrub communities at 1240 to 2745 m in Beaver, Box Elder, Daggett, Duchesne, Juab, Salt Lake, Tooele, Utah, Wasatch, and Washington counties; Nevada, Idaho, and Wyoming (?); 31 (ii).

**Var. *neglecta* (Sharp) Cronq.** [*B. hirsuta* var. *neglecta* Sharp]. Salt desert shrub, sagebrush, pinyon-juniper, and ponderosa pine communities at 1640 to 2625 m in Daggett, Duchesne, and Uintah counties; Nevada, Idaho, and Wyoming (?); 18 (ii). Plants of this variety form hybrids with *B. sagittata*.

***Balsamorhiza macrophylla* Nutt.** Cutleaf Balsamroot. Perennial scapose herbs from a thick taproot, mainly 3–7 dm tall; leaves 15–60 cm long, 3.7–25 cm wide, pinnatifid, the segments entire, few toothed or lobed, up to 12.5 cm long; peduncles sparingly long shaggy-villous, naked, or with one to few re-

duced leaves near the base; heads solitary; involucre 23–35 mm high, 30–60 mm wide, the bracts lance-linear, attenuate, long-ciliate, glandular and more or less long-villous dorsally; rays 9–14, yellow, 30–55 mm long; achenes glabrous. Mountain brush and sagebrush or bunchgrass communities at 1525 to 2290 m in Box Elder, Cache, Salt Lake, Summit, Utah, and Weber counties; Idaho to Montana and Wyoming; 7 (0).

***Balsamorhiza sagittata* (Pursh) Nutt.** Arrowleaf Balsamroot. [*Bupthalmium sagittatum* Pursh]. Perennial scapose herbs, from thick taproot, mainly 1.5–8 dm tall; leaves (including long slender petioles) 5–45 cm long, 1.5–15 cm wide, sagittate, entire, or the cauline ones from near the summit to near the middle of the subscapose stem and linear to elliptic; peduncles villous-tomentose; heads solitary (or with additional reduced ones); involucre 15–30 mm long, 20–50 mm wide, the bracts lance-linear, attenuate, villous-tomentose; rays 8–25, yellow, 25–60 mm long; achenes glabrous. Sagebrush, mountain brush, pinyon-juniper, ponderosa pine,



Douglas fir, aspen, and fir communities at 1340 to 3020 m in Beaver, Box Elder, Cache, Davis, Garfield, Iron, Juab, Kane, Millard, San Juan, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, and Washington counties; British Columbia to Montana and South Dakota, south to California, Nevada, and Colorado; 43 (vii).

#### BELLIS L.

Scapose perennial herbs, with fibrous roots and short stolons, the juice watery; stems leafless, simple; leaves all basal, simple, petiolate, toothed to entire; heads solitary; involucre bracts in 2 subequal series, herbaceous; receptacle conic to hemispheric, naked; rays white, pink, or purple, numerous, pistillate; disk flowers numerous, perfect, yellow; pappus lacking; style branches flattened; achenes flattened, usually 2-nerved, pubescent.

*Bellis perennis* L. European Daisy. Plants 0.2–2 dm tall; leaves all basal, with short to long petioles, the blades 0.7–3 (4) cm long, 5–25 mm wide, obovate to oval or orbicular, dentate to entire, obtuse to rounded or emarginate apically, pubescent on both sides with coarse spreading hairs; scapes pubescent with ascending hairs; heads solitary; in-

1. Leaves simple, the middle and upper ones (at least) sessile or subsessile ..... *B. cernua*
- Leaves pinnately compound, with 3–5 leaflets, all petiolate ..... *B. frondosa*

*Bidens cernua* L. Bur-marigold. Plants 1–13 dm tall, the stems sparingly spreading-hairy to glabrous; leaves simple, 1.5–15 cm long, 0.5–4 cm wide, narrowly lanceolate to lance-ovate, coarsely serrate to subentire, glabrous; heads nodding in age; outer involucre bracts 5–8, green, foliaceous, unequal, spreading or reflexed, the inner bracts erect, mostly 6–15 mm long; rays 6–8, yellow, or lacking; achenes mainly 5–7 mm long, tan, the 2–4 awns retrorsely barbed. Wet meadows, bogs, stream banks, bars, and shores, at 1300 to 2380 m in Cache, Garfield, Juab, Kane, Salt Lake, Sevier, Summit, Uintah, and Tooele counties; widely distributed in the Northern Hemisphere; 27 (iii).

*Bidens frondosa* L. Devil's Beggarticks. Plants 2–12 dm tall, the stems short-hairy to glabrous; leaves petiolate, pinnately compound with 3–5 leaflets, these 2–10 cm long,

volucres 4–7 mm high, 9–15 mm wide, the bracts ovate to broadly lanceolate, rounded to obtuse apically, sparsely hairy dorsally, often suffused with purple, mostly 8–10 mm long, 1.5–2.5 mm wide; pappus lacking; achenes flattened. Cultivated ornamental, escaping and persisting in lawns of lower valleys in Salt Lake and Utah counties; adventive from Europe; 4 (0).

#### BIDENS L.

Annual herbs with fibrous roots, or rooting along the lower stem, the juice watery; stems decumbent to erect, commonly branched; leaves opposite, simple or pinnately compound; heads few to several in cymose inflorescences; involucre bracts in 2 series, the outer herbaceous, the inner somewhat petaloid and striate; receptacle flat or slightly convex, chaffy throughout, the chaff similar to the inner involucre bracts; ray flowers present, yellow, neutral or pistillate, or lacking; disk flowers numerous, perfect, fertile, yellow; pappus of (1) 2–4 awns or teeth, these retrorsely barbed, persistent; style branches flattened; achenes flattened, pubescent, usually 2- to 4-awned.

SHERFF, E. E. 1937. The genus *Bidens*. Field Mus. Pub. Bot. 16:1–709.

0.5–3 cm wide, lanceolate, serrate; heads erect in age; outer involucre bracts 5–8, green, subfoliaceous, subequal, erect or spreading, the inner bracts erect, mostly 5–8 mm long; rays usually lacking; achenes 5–9 mm long, dark brown to black, the 2 awns barbed. Marshes, pond and lake shores, bars, wet meadows, and irrigation canals at 1190 to 1650 m in Davis, Grand, Salt Lake, and Utah counties; widespread in North America; 12 (ii). **Note:** The panboreal weed, *Bidens tripartita* L., might occur in our area. It is distinguished from *B. frondosa* in its simple but trifid leaves, and from *B. cernua* in its petiolate trifid leaves.

#### BRICKELLIA Ell. Nom. Cons.

Perennial herbs, subshrubs or shrubs; leaves alternate or opposite, simple; heads cam-

panulate or cylindric, cymose or paniculate, discoid; flowers all perfect, fertile; involucre bracts imbricate in several series, striate; receptacle almost flat, naked; style branches flattened, with long-papillate appendage;

achenes 10-ribbed; pappus of barbellate, smooth, or subplumose bristles.  
ROBINSON, B. L. 1917. A monograph of the genus *Brickellia*. Mem. Gray. Herb. 1: 1-151.

- 1. Leaves spinulose-serrate, or spinulose tipped; low rounded shrubs of Washington and San Juan counties ..... *B. atractyloides*
- Leaves entire or toothed, not spinulose; herbs, subshrubs, or tall shrubs of various distribution ..... 2
- 2(1). Plants herbaceous; heads reflexed, broadly campanulate; leaves sagittate- to cordate-ovate, longer than broad ..... *B. grandiflora*
- Plants, shrubs, or subshrubs; heads narrowly cylindric, or, if campanulate, erect; leaves ovate to linear, if cordate, about as broad as long or broader ..... 3
- 3(2). Leaves petiolate, the blades cordate-ovate to ovate or suborbicular, 1-5 cm broad ..... *B. californica*
- Leaves sessile or subsessile, linear to narrowly lanceolate, or, if broader, mainly less than 1 cm broad ..... 4
- 4(3). Leaves linear to lanceolate or narrowly elliptic; shrubs 6-15 dm tall or more; flowers 3-5 per head ..... *B. longifolia*
- Leaves ovate to oval or oblong to linear; shrubs or subshrubs less than 5 dm tall; flowers many per head ..... 5
- 5(4). Leaves 5-10 times longer than broad or more, entire or nearly so, sessile; involucre 10-20 mm high ..... *B. oblongifolia*
- Leaves only somewhat longer than broad, often toothed or lobed, at least some evidently petiolate; involucre 8-12 mm high ..... *B. microphylla*

***Brickellia atractyloides* Gray** Shrubs, much branched, mostly 3-5 dm tall, the branchlets greenish to straw colored, soon gray; leaves alternate, short-petiolate, the blades 0.6-3.2 cm long, 0.3-2.2 cm wide, lance-ovate to ovate, obtuse to rounded basally, spinulose-serrate to entire, acuminate and spinulose tipped apically, thick and prominently veined, glabrous or minutely glandular puberulent; heads solitary, terminating the branches; peduncles 1-5.2 cm long, glandular-puberulent; involucre 10-13.5 mm high, 8-16 mm wide, the outer bracts ovate-lanceolate, acuminate apically, many veined; the inner narrower, glandular-puberulent dorsally; flowers 50-75 or more; achenes black, 3.8-4.2 mm long, hirtellous on the ribs. Rock crevices and talus slopes, creosote bush, blackbrush, and indigo bush communities at 820 to 1130 m in San Juan (confluence of San Juan and Glen Canyon arms of Lake Powell) and Washington counties; Nevada and Arizona; 9 (i). The type is

from the Colorado River (Utah?), Palmer sn, 1870 (US!).  
***Brickellia californica* Gray** [*Bulbostylis californica* T. & G.; *Coleosanthus californicus* (T. & G.) Kuntze]. Subshrubs, mainly 5-10 dm tall, the branchlets whitish to brownish; leaves alternate, petiolate, the blades 1.7-5.2 cm long, 1.3-4.5 cm wide, cordate-ovate to ovate or orbicular, truncate to cordate basally, crenate-serrate, rounded to obtuse apically, the veins not prominent, glandular-scabrous; heads clustered in a leafy-bracteate panicle; sessile or shortly pedunculate; involucre 5.5-8 mm high, 4-7 mm wide, the outer bracts very short, rounded apically, few veined, the inner long and slender, often suffused with red or purple, glabrous; flowers 8-18; achenes straw colored, 2.5-3.5 mm long. Canyons and rock outcrops at 825 to 2135 m in Garfield, Kane, San Juan, Utah, and Washington counties; Colorado to California and south to Texas and Mexico; 15 (iii).

*Brickellia grandiflora* (Hook.) Nutt. [*Eupatorium grandiflorum* Hook.]. Perennial herb, from a caudex and taproot, the stems green to straw colored, 2.5–9.5 dm tall; leaves alternate, petiolate, the blades sagittate to cordate-ovate, 1.5–9 (11) cm long, 0.6–6.5 cm wide, cordate to truncate basally, serrate to doubly so, attenuate to acuminate apically, the veins not prominent, minutely puberulent or hirtellous; heads several to numerous in short corymbose panicle, commonly reflexed; involucre 7–12 mm high, 6–10 mm wide, the outer bracts lance-acuminate, the inner abruptly acuminate, puberulent dorsally; flowers mostly 20–40 (70); achenes brown to black, 3.5–4.5 mm long, hirtellous. Pinyon-juniper, mountain brush, ponderosa pine, aspen, Douglas fir–white fir, spruce, and bristlecone pine communities at 1640 to 3200 m in Beaver, Duchesne, Garfield, Iron, Juab, Kane, Salt Lake, San Juan, Tooele, Utah, and Washington counties; Washington east to Missouri, south to Mexico; 34 (vii).

*Brickellia longifolia* Wats. [*Coleosanthus longifolia* (Wats.) Kuntze]. Shrubs, with stems and white to tan bark, mainly 10–15 dm tall; leaves alternate, sessile or subsessile, 1.2–13.5 cm long, 3–8 mm broad, lance-linear to lance-elliptic, obtuse to acute basally, attenuate apically, the veins not prominent,

glabrous, glandular-resinous; heads numerous in panicles; involucre 3.4–6.2 mm high, 2.3–4 mm wide, the outer bracts ovate, acute, the inner, longer and slender, glabrous; flowers 3–5; achenes 1.8–2.4 mm long, brown, glabrous. Canyon bottoms, stream margins, seeps, and hanging gardens at 750 to 1590 m in Emery, Garfield, Grand, Kane, San Juan, Washington, and Wayne counties; California, Nevada, Arizona; 23 (viii).

*Brickellia microphylla* (Nutt.) Gray [*Bulbostylis microphyllus* Nutt.]. Shrubs or subshrubs, with tan to whitish bark, mainly 2–7 dm tall; leaves alternate, shortly petiolate to subsessile or sessile, 3–14 (20) mm long, 1–9 (12) mm wide, ovate to suborbicular, toothed to entire, commonly glandular-villous or -hispidulose, the veins not especially prominent, rounded to acute apically; heads solitary or few at tips of branches, racemously arranged in leafy-bracteate panicles; involucre 7–10.3 mm high, 4–8.5 mm wide, the outer bracts oval to ovate, with thickened glandular tips, the inner often lacking glands and more or less 3-lobed or 3-veined; flowers 8–18; achenes 3.5–4.3 mm long, blackish, hirtellous or glabrous. Two distinctive phases, which have been treated at specific level, are present in Utah. There is justification for treating them at specific rank, but they are similar in vegetative features and general aspect.

1. Flowers 8–11 per head; involucre 7–10 mm long; 4–7.5 mm wide; plants of the Green, Colorado, and Virgin river systems ..... *B. microphylla* var. *scabra*
- Flowers (12) 17–18 per head; involucre 8.5–10.3 mm long, 6.5–10 mm wide; plants of the Great Basin ..... *B. microphylla* var. *watsonii*

**Var. *scabra*** Gray Blackbrush, rabbitbrush, sagebrush, shadscale, Grayia, greasewood, juniper, and pinyon-juniper communities mainly on sandstone outcrops at 885 to 2170 m in Daggett, Duchesne, Emery, Garfield, Grand, Kane, San Juan, Uintah, and Washington counties; Colorado, Nevada, Arizona. Our material is uniformly hispidulose-glandular along upper stems at least, and has 8–11 flowers per head; 35 (xi). **Note:** A peculiar specimen from San Juan County (Anderson A-6 BRY) has heads nearly all clustered at branch tips.

**Var. *watsonii*** (Robins.) Welsh comb. nov. [based on *Brickellia watsonii* Robins. Mem. Gray Herb. 1:42. 1917]. Sagebrush, shadscale,

mountain brush, and juniper communities at 1525 to 2440 m in Juab, Millard, Sevier, Tooele, and Utah counties; Nevada and California. All modern floras distinguish *B. microphylla* by its heads “about 22-flowered.” Our material fits well within the concept of *B. watsonii* Robins., which has heads “18-flowered.” Specimens from the Great Basin of Utah are uniformly 18-flowered, except in *depauperate* heads that vary downward to 12 flowers per head. Stems are villous to glandular-villous, with the type of *B. watsonii* Robins. (Watson 494 US!) at the villous end of a cline; 7 (ii).

***Brickellia oblongifolia*** Nutt. Subshrubs or subherbaceous, with green to tan branches,



mainly 1–5.5 dm tall; leaves alternate, sessile or nearly so, 0.9–4 cm long, 1–11 (15) mm wide, elliptic to oblong, or lance-oblong, entire or essentially so, glandular-hispidulous, the veins not especially prominent, acute to attenuate or obtuse apically; heads solitary and terminating branches, or corymbosely arranged; involucre 10.8–15 mm long, 12–22 mm wide, the bracts all acute to acuminate, glabrous or glandular to glandular-puberulent; flowers (11) 26–40 (50); achenes 4.8–5.8 mm long, blackish, hispidulous. Grayia, shadscale, rabbitbrush, blackbrush, desert almond, juniper, pinyon-juniper, and ponderosa pine communities at 1280 to 2500 m in Beaver, Duchesne, Emery, Garfield, Juab, Kane, Millard, San Juan, Sevier, Uintah, Utah, Wasatch, Washington, and Wasatch counties; British Columbia to Montana, south to California, Arizona, and New Mexico. Our material is assignable to var. *linifolia* (D.C.

Eaton) Robins. [*B. linifolia* D.C. Eaton, type from Jordan Valley, American Fork] which is distinguished by its achenes being hispidulous, not glandular-hispidulous or glandular. The segregation is tenuous at best; 41 (x).

CALYCOSERIS Gray

Annual subscapose or caulescent herbs, with milky juice, from taproots, beset with tacklike stipitate glands above; leaves mostly basal, pinnately parted; heads solitary or few on leafy-bracteate peduncles; involucre bracts in 2 series, herbaceous, the inner with hyaline margins; receptacle with capillary bristles; corollas all raylike, yellow or white tipped; achenes fusiform, 5- or 6-ribbed, tapering to a short beak, this produced apically into a low denticulate cup; pappus abundant, white, of barbellate capillary bristles falling attached.

- 1. Rays white, with pink or purple dots or streaks dorsally; stipitate glands pale ... *C. wrightii*
- Rays yellow; stipitate glands purple ..... *C. parryi*

*Calycoseris parryi* Gray Annual herbs, mainly 0.7–3 dm tall, the stems simple or with spreading branches; leaves basal and alternate along stem, pinnately parted, the lobes linear, reduced and entire above, glabrous except for a few tangled long hairs on lower surface; peduncles mainly 0.5–4 cm long, clad with tacklike, long-stipitate, purple or purplish-black glands; involucre 11–15 mm high, 8–14 mm wide (when pressed), the bracts linear-subulate to lance-subulate, more or less stipitate-glandular, attenuate apically; rays yellow, 10–20 (25) mm long; pappus surpassing the achene. Creosote bush and Joshua tree communities, reported for Utah by Munz (1959. Calif. Flora p. 1300); to be expected in Washington County; California and Arizona. Measurements are from Arizona and California materials; 0 (0).

*Calycoseris wrightii* Gray Annual herbs, mainly 1.4–4 dm tall, the stems commonly with spreading branches; leaves basal and alternate along the stem, pinnately parted, the lobes linear, reduced and subentire upward, glabrous except for a few long tangled hairs on lower surface; peduncles mainly 0.3–5 cm long, clad with tacklike long-stipitate pale

glands; involucre 12–17 mm long, 12–20 mm wide, the bracts linear-subulate to lance-subulate, more or less stipitate-glandular, attenuate apically, rays 10–25 mm long, white, with pink or purple markings dorsally; pappus shorter than achene. Creosote bush and Joshua tree communities in Washington County; California, Nevada, Arizona; 1 (0).

CARDUUS L.

Biennial or annual herbs with taproots, the juice watery; stems erect, simple or branched; leaves alternate simple, pinnatifid to bipinnatifid or merely pinnately lobed, often decurrent, spiny; heads solitary or few, borne in corymbose cymes; involucre bracts imbricated in several series, spine tipped; receptacle hemispheric, densely bristly; disk flowers only present, perfect, red-purple, with long slender lobes; pappus of barbellate bristles; style branches connate, shortly hairy at base of branches; achenes compressed.

*Carduus nutans* L. Nodding Thistle; Musk Thistle. Rank biennial or annual herbs, mostly 0.6–20 (25) dm tall; stems arachnoid-tomentose to glabrate; leaves alternate, decurrent, 3–40 cm long, 0.5–20 cm wide (or

more), lance-linear to elliptic, glabrous, or tomentose along veins beneath; heads commonly solitary, nodding; involucre 20–30 mm long, 30–80 mm wide, the bracts 2–8 mm wide, ovate-lanceolate to lanceolate, glabrous or nearly so, spinose tipped, at least the outermost reflexed near the middle, the midrib prominent; flowers red-purple; achenes 3.5–4.5 mm long, smooth, marked with vertical lines, umbonate. Disturbed sites along roads and in fields and pastureland at 1340 to 2440 m in Daggett, Juab, Salt Lake, Sanpete, and Utah counties, and probably universal; introduced Old World plants, now widely established in the United States; 15 (ii).

CENTAUREA L.

Annual, biennial, or perennial herbs with taproots or rhizomes, the juice watery; stems erect or ascending; leaves alternate, entire to

pinnatifid; heads solitary, or few to numerous, discoid; involucre bracts imbricate in several series, spine tipped or some of them enlarged and with scarious or hyaline erose to lacerate or pectinate appendages; receptacle bristly; flowers all tubular, perfect, or the marginal ones sterile and falsely subradiate; purple, blue, yellow, pink, or white; pappus of bristles, scales, or none; style branches more or less connate, with a thickened often hairy ring at the base; achenes obliquely or laterally attached to receptacle. Note: This is a large genus, mainly of the Mediterranean region of the Old World, but with some indigenous to North America, Australia, and South America. All of ours are introduced, and the potential for other introductions in this remarkable genus is great. In Flora Europaea, our species are treated within three genera: *Amberboa* (Pers.) Less. (*C. moschata* L.), *Acroptilon* Cass (*C. repens* L.), and *Centaurea* for the others.

- 1.      Involucral bracts definitely spine tipped, at least some with spines 1–20 mm long ..... 2
- Involucral bracts definitely not spine tipped, or, if shortly spinose as in *C. maculosa* and *C. scabiosa*, the heads 6–25 mm wide ..... 5
- 2(1).   Stem definitely winged, the leaf bases decurrent; pappus present (central flowers, at least) ..... 3
- Stems angled, not winged; pappus none ..... 4
- 3(2).   Apical spine of involucral bract 5–9 mm long; plants arachnoid when young; flowers all with evident pappus ..... *C. melitensis*
- Apical spine of involucral bract 11–20 mm long; plants persistently tomentose; flowers in center only with a pappus ..... *C. solstitialis*
- 4(2).   Apical spine of bracts 5–15 mm long or more ..... *C. calcitrapa*
- Apical spine of bracts 1–4 mm long ..... *C. virgata*
- 5(1).   Leaves entire or merely toothed, not pinnatifid ..... 6
- Leaves pinnatifid or deeply pinnately lobed ..... 8
- 6(5).   Leaves linear to lance-linear, entire or nearly so, less than 1 cm wide ..... *C. cyanus*
- Leaves various, but, if as above, plants rhizomatous ..... 7
- 7(6).   Plants rhizomatous; leaves mainly 2–10 mm wide; pappus evident, 6–11 mm long ..... *C. repens*
- Plants not rhizomatous; leaves 6–15 mm wide; pappus 2–5 mm long ..... *C. jacea*
- 8(5).   Leaves merely pinnately lobed; involucral bracts entire or nearly so .....  
..... *C. moschata*
- Leaves pinnately divided, the lobes linear to narrowly oblong; involucral bracts pectinately lobed ..... 9

- 9(8).      Involucres 15–25 mm wide; lobes of leaves often again toothed or lobed ..... *C. scabiosa*  
—      Involucres mainly 6–10 mm wide; lobes of leaves usually entire ..... *C. maculosa*

*Centaurea calcitrapa* L. Star-thistle. Biennial herbs, from taproots, the stems usually branched, 1–8 dm tall, arachnoid-villous to glabrate; leaves 0.5–4.5 cm long, pinnatifid, the lobes linear to oblong, attenuate, or the upper ones entire; heads few to numerous; involucre urn shaped, 10–18 mm high, mainly 8–12 mm wide, the bracts weakly spinose-ciliate, with a stout apical spine mainly 5–30 mm long; flowers few, purple; pappus none. Roadside weeds, Utah County (Wadley & Holmgren 381 UT); introduced from Eurasia; 1 (0).

*Centaurea cyanus* L. Bachelor's Button; cornflower. Annual or biennial herbs from taproots, the stem usually branched, mostly 1–8 (12) dm tall, arachnoid-tomentose; leaves 2–10 (13) cm long, 1–8 mm wide, entire or some with slender lobes, attenuate; heads few to numerous; involucre hemispheric, 10–16 mm high, 10–23 mm wide, the bracts with a tapering pectinate or fringed tip, often purplish suffused, the central apical tooth not especially spinose; flowers several, blue, purple, pink, or white, the marginal ones enlarged, irregular; pappus 2–3 mm long. Cultivated ornamental, now established in disturbed sites in Cache, Salt Lake, Tooele, Utah, Wasatch, and Washington counties; adventive from Europe; 6 (0).

*Centaurea jacea* L. Perennial herbs from taproots, the stems simple or branched from the middle, mostly 5–12 dm tall, glabrous or somewhat arachnoid; leaves entire or toothed to shallowly lobed, the basal ovate to lanceolate, petiolate, becoming smaller upward; heads few to numerous; involucre 12–18 mm high, 12–15 mm wide, ovoid, the bracts with orbicular appendages, scarious, brown, darker in middle, the outer denticulate to pectinate-lacerate, the inner less so and often bifid; flowers purple or white, the outer more or less radiate; pappus none or very short. Cultivated ornamental, now established in Salt Lake County; adventive from Europe; 0 (0). **Note:** The large headed *C. montana* L., is cultivated in Utah. It has wedge-shaped involucral bracts and decurrent large leaves.

*Centaurea maculosa* Lam. Biennial or short-lived perennial, the stems simple or commonly branched above the middle, mainly 3–10 (15) dm tall, tomentose and sparingly scabrous-puberulent; leaves 1–9 cm long, pinnatifid, the lobes linear to lanceolate or oblong, entire or variously toothed or lobed, reduced and bracteate in the inflorescence; heads few to many, hemispheric to vase shaped; involucre 10–13 mm high, 10–13 mm wide, the bracts with short dark pectinate tip, the central tooth produced as a spine to 0.5 mm long; flowers pink or purplish, rarely white, the marginal ones radiate; pappus to 2 mm long, rarely lacking. Roadsides in Beaver, Juab, and Tooele counties; adventive from Europe; 3 (i).

*Centaurea melitensis* L. Annual or biennial, the stems sparingly branched from middle or below, 1.5–8 dm tall, winged by decurrent leaf bases; basal and lower cauline leaves oblanceolate, toothed to lyrate-pinnatifid or sinuately lobed, reduced upward, finally entire; heads solitary, terminating branches, or 2 or 3 in clusters; involucre 8–15 mm high, 8–12 mm wide, tapering apically, the middle and outer bracts spine tipped, the spines 5–8 mm long; flowers yellow, all alike; pappus 1.5–3 mm long. Adventive Old World species of disturbed sites in Salt Lake County (Without collector UT); 1 (0).

*Centaurea moschata* L. [*Amberboa moschata* (L.) DC.]. Annual herbs; simple or sparingly branched, mainly 3–7 dm long, sparingly tomentose; leaves 1–9.5 cm long, 1–3 cm wide, pinnatifid, the lowermost petiolate, becoming sessile upward; heads solitary, on peduncles 8–15 cm long or more; involucre vase shaped, 12–14 mm high, 18–22 mm wide, the bracts oval, with purplish margins, only the inner with broad, reflexed, entire appendage; flowers pink; pappus shorter to about equaling the achenes. Cultivated ornamental, escaping and persisting in Washington County; adventive from Asia; 1 (0).

*Centaurea repens* L. Russian Knapweed. [*C. picris* Pallas ex Willd.; *Acroptilon repens*



(L.) DC.]. Perennial rhizomatous herbs, mostly 3-8 dm tall, arachnoid-tomentose to glabrate; leaves in a basal rosette and cauline, the basal leaves often withered by flowering time, the cauline mainly 1-6 cm long, 2-12 mm wide, entire or serrate; heads few to numerous, terminating branches; involucre 9-15 mm high, 5-12 mm wide, more or less urn shaped, middle and outer bracts broad, glabrous, with broader rounded, subentire hyaline tips, the inner bracts narrow, tapering, and with plumose hairy tips; flowers pink to purplish, all alike; pappus bristle subplumose, 6-11 mm long. Introduced Old World primary noxious weed, now widely established at 1220 to 2380 m in Cache, Daggett, Duchesne, Emery, Garfield, Grand, Kane, San Juan, Salt Lake, Tooele, Uintah, and Utah counties; widespread in North America; adventive from Eurasia; 28 (ii).

*Centaurea scabiosa* L. Perennial herbs, mostly 5-15 dm tall, scabrous-puberulent; leaves 4-20 cm long or more, the lowermost long-petiolate, once to twice pinnatisect, the segments linear to oblong, entire or dentate-serrate to lobed, the upper pinnately divided, sessile; heads few to several, terminating branches; involucre 13-20 mm high, 18-25 mm wide, ovoid-globose; bracts ovate, glabrous or arachnoid, the appendages triangular-ovate, brown or black, with pale brown teeth; flowers purple, alike or nearly so; pappus 4-5 mm long. Cultivated ornamental, persisting and escaping, Salt Lake County and probably elsewhere; adventive from Europe; 2 (0).

*Centaurea solstitialis* L. Annual or biennial, grayish tomentose, the stems 1-6 (10) dm tall, evidently winged; leaves mainly 1-12 (20) cm long, 0.1-3 (5) cm wide, the basal ones lyrate to pinnatifid, the cauline ones progressively smaller and entire upwards, linear to linear-subulate; heads few to

numerous, terminating branches; involucre 8-15 mm high, 7-15 mm wide, urn shaped, the middle and outer bracts with central apical spines 10-20 (30) mm long, the inner with a small hyaline appendage; flowers yellow, all alike; pappus of marginal flowers none, that of the central ones 3-5 mm long. Roadsides and abandoned fields at 915 to 1900 m in Wasatch, Washington, and Weber counties; adventive from Europe; 4 (i).

*Centaurea virgata* Lam. Perennial, from a caudex, more or less grayish tomentose, the stems 4-9 dm tall, branched above; leaves mainly 0.5-15 cm long, 0.1-6 cm wide, the basal ones petiolate, once to twice pinnately divided, the lobes linear, these often again toothed or lobed; cauline leaves smaller, sessile, and lobed to entire; heads several to numerous, terminating short branches; involucre 7-10 mm high, 3-5 mm wide, the bracts pale or suffused with red or purple, with a slender apical spine 1-2 mm long; flowers pink; pappus about 1.5 mm long. Roadsides and other disturbed sites in Grand, Juab, and Utah counties at 1525 to 1830 m; adventive from Eurasia; 5 (i).

CHAENACTIS DC.

Annual, biennial, or perennial herbs, from taproots; leaves alternate or mainly basal, pinnately dissected to entire; heads solitary or few to several, borne in corymbose cymes, discoid, the flowers white, or cream to pink, all perfect, the marginal ones sometimes enlarged and raylike; involucre bracts in 1-3 series, herbaceous; receptacle flat, naked; pappus of 4-20 hyaline scales; style branches slightly compressed; achenes clavate, terete or more or less compressed.

STOCKWELL, P. 1940. A revision of the genus *Chaenactis*. Contr. Dudley Herb. 3:89-168.

- 1. Plants perennial from a simple or branching caudex; 2-9 cm tall; stemless or with few short internodes; of high elevations ..... *C. alpina*
- Plants annual or biennial, rarely perennial, the caudex seldom developed; stems mainly 10-30 cm tall, or, if less, plants definitely not perennial; distribution usually of middle and lower elevations ..... 2
- 2(1). Basal rosette well developed; plants biennial or short-lived perennials; pappus scales 10-16 ..... *C. douglasii*

- Basal rosettes poorly, if at all, developed; plants annual; pappus scales 4 or 5 (rarely 8) ..... 3
- 3(2). Lower and upper cauline leaves simple, the middle ones few lobed; Washington County ..... *C. fremontii*
- Lower, middle, and upper leaves pinnately divided, or only the uppermost simple ..... 4
- 4(3). Heads mostly 15–22 mm high; flowers pink, much surpassing the involucre; anthers included ..... *C. macrantha*
- Heads mostly 8–10 mm high; flowers white or cream, only slightly surpassing the involucre; anthers exerted ..... 5
- 5(4). Involucral bracts blunt or nearly acute apically; plants widely distributed ..... *C. stevioides*
- Involucral bracts long-attenuate and bristle tipped apically; plants of Washington and Millard counties ..... *C. carphoclina*

*Chaenactis alpina* (Gray) Jones Alpine Dusty-maiden. [*C. douglasii* var. *alpina* Gray]. Perennial, from a simple or branched, sometimes soboliferous caudex, 3.5–9 cm tall; stems with few contracted internodes, very short, or not developed; leaves 1.3–5 cm long, pinnately divided, the lobes again toothed or lobed, 1–7 mm long, gray tomentose to glabrate; heads solitary or sometimes 2, the peduncles tomentose or glandular, 0.5–6 cm long; involucre (7.5) 10–13 mm long, (8) 10–17 mm wide, the bracts often suffused with purple, glandular or tomentose; corolla purplish to white, glandular or sparingly tomentose; pappus of 10 oblong-spatulate rounded hyaline scales, in 2 series; achenes 6–8 mm long, hairy. Boulder stripes and talus in alpine tundra or upper montane communities at 2980 to 3965 m in Duchesne, Salt Lake, Summit, and Utah counties; Oregon to Montana, California and Colorado. Our materials are separable into two more or less distinctive phases; a glandular phase, with distribution mainly in the Wasatch Mountains, which is var. *alpina* [including *C. rubella* Greene; *C. alpina* var. *rubella* (Greene) Stockwell], and a tomentose phase, mainly from the Uinta Mountains, which might be assignable to var. *leucopsis* (Greene) Cockerell [*C. leucopsis* Greene]. More work is necessary, including evaluation of the type specimen of var. *leucopsis*; 10 (i).

*Chaenactis carphoclina* Gray Annual, from a taproot, 6–28 (40) cm tall; stems well developed, more or less flexuous; leaves 0.8–5.6 cm long, mealy-puberulent, 1- to 2-

pinnatifid, the segments linear-filiform, 1–20 mm long; heads few to numerous, on slender farinose to glandular peduncles 0.4–3 cm long; involucre 6–9 mm high, 6–15 mm wide, the bracts lance-attenuate into slender, bristlelike tips, glandular; flowers white to cream; pappus of central flowers usually of 4 lance-acuminate scales, those of marginal flowers sometimes shorter; achenes 3.5–4.5 mm long, hairy. Larrea community at 850 to 1000 m in Washington County; California, Nevada, Arizona; 10 (0).

*Chaenactis douglasii* (Hook.) H. & A. Douglas Dusty-maiden. [*Hymenopappus douglasii* Hook.; *C. achilleaefolia* H. & A.; *C. douglasii* var. *achilleaefolia* (H. & A.) A. Nels.; *C. douglasii* var. *montana* Jones; *C. brachiata* Greene, type from Springdale; *C. brachiata* var. *stansburyi* Stockwell, type from Stansbury Island]. Biennial or short-lived perennial, from a taproot, seldom with a caudex, mainly 5–50 (60) cm tall, sparsely to densely tomentose; stems with few to many well developed internodes; leaves 0.6–12 (15) cm long, 1–3 pinnatifid, the lobes 1–3 cm long, tomentose to glabrate; heads solitary or several in a corymbose cyme; involucre 7–16 mm high, 8–25 mm wide, the bracts glandular to glandular-tomentose, oblong to narrowly oblanceolate or linear, blunt apically; flowers white to pink; pappus of 10–16 scales in 2 series; achenes 6–8 mm long, hairy. Shadscale, sagebrush, pinyon-juniper, mountain brush, ponderosa pine, white fir, Douglas fir, aspen, and limber pine communities at 1340 to 3050 m in all Utah

counties; British Columbia to Montana, south to California, Arizona, and Colorado. It does not seem reasonable to attempt to segregate our materials into varieties. The variability apparently does not demonstrate geographic correlation; 132 (xx).

*Chaenactis fremontii* Gray Annual or winter annual, from a taproot, 10–25 (40) cm tall, glabrate or sparingly tomentose when young; leaves 0.6–6.5 cm long, the lower and upper simple, linear, the middle few lobed, glabrous; heads solitary to several on tomentose to glabrate (glandular?) peduncles 1–5 cm long; involucre 8–10 mm high, 10–12 mm wide, glabrous or tomentose, attenuate but not caudate; flowers white to pinkish, the outer ones enlarged; pappus of central flowers of 4 scales; achenes hairy. Creosote bush and Joshua tree communities at 670 to 885 m in Washington County; Arizona, Nevada, California; 2 (0).

*Chaenactis macrantha* D.C. Eaton Annual or winter annual, from a taproot, mainly 6–25 cm tall, branching from the base or simple, floccose-tomentose to glabrate; leaves 0.5–5 cm long, 1- to 2-pinnatifid, the lobes to 1 cm long, broad, floccose to glabrate; heads solitary to several, on tomentose peduncles 0.5–5 cm long; involucre 12–17 mm high, 8–22 mm wide, the bracts oblong-lanceolate, rather abruptly short-acuminate, tomentose; corollas pink to white, all about alike; anthers included; pappus of 4 linear-oblong scales and 2–4 short outer ones or these lacking; achenes hairy. Shadscale, pinyon-juniper, creosote bush, and blackbrush communities at 885 to 2135 m in Beaver, Juab, Kane, Milard, Tooele, and Washington counties; California, Nevada, Arizona; 17 (iii).

*Chaenactis stevioides* H. & A. Annual or winter annual, from a taproot, mainly 4–42 cm tall, branching from the base or simple, more or less tomentose; leaves 0.3–10 cm long, 1–2 pinnatifid, the lobes to 2.5 cm long, linear to oblong, sometimes all or nearly all simple in depauperate specimens; heads solitary to several on glandular peduncles 0.3–3 cm long; involucre 6–11 mm high, 8–22 mm wide, the bracts oblong-lanceolate to linear, acute to shortly acuminate apically, glandular; corollas white to cream, the outer ones enlarged; pappus of 4 oblong-lanceolate scales; achenes hairy. Creosote bush, blackbrush, mat-atriplex, shadscale, indigo bush,

and juniper communities at 915 to 1891 m in Beaver, Carbon, Duchesne, Emery, Garfield, Grand, Juab, Kane, San Juan, Washington, and Weber counties; Wyoming south to Nevada, west to California; 63 (vi).

#### CHAMAECHAENACTIS Rydb.

Perennial scapose herbs from a long-pilose caudex, clothed with marcescent leaf bases, and taproot, with watery juice; leaves all basal, petiolate, simple; heads solitary; involucre turbinate, the bracts subequal or the outer shorter; receptacle naked; rays none; disk flowers perfect, fertile, cream colored to pink; pappus of hyaline scales; style branches flattened, papillate; achenes 4-angled, hairy.

*Chamaechaenactis scaposa* (Eastw.) Rydb. [*Chaenactis scaposa* Eastw.] Plants 2–9 cm tall, the scapes long-villous; leaves petiolate, the blades 0.4–1.8 cm long, 3–13 (15) mm wide, lance-oblong to ovate, to oval or orbicular, obtuse to rounded apically, obtuse to truncate basally, villous beneath, strigose to strigulous or villous above; heads solitary; involucre 7–17 mm high, 10–23 mm wide, the bracts oblong or linear-oblong, the outer densely villous, green or suffused with red-purple, the margin hyaline; corollas cream to pink; pappus scales oblanceolate-spatulate, rounded; achenes black, hirsute-pilose. Shadscale, galleta, pygmy sagebrush, mountain brush, pinyon-juniper, and ponderosa pine communities at 1580 to 2565 m in Carbon, Duchesne, Emery, Garfield, Grand (?), and San Juan counties; Arizona and Colorado; 40 (v).

#### CHAMOMILLA S.F. Gray

Annual herbs, aromatic in some; leaves alternate, 2- or 3-pinnatifid, with linear filiform ultimate segments; heads radiate or discoid, solitary or corymbose; involucre bracts greenish-chartaceous, the margins hyaline, in 2 or 3 series, subequal to imbricate; receptacle conic, hollow, naked; marginal flowers pistillate; rays (when present) white, the central disk flowers perfect and fertile, the style branches truncate, tufted-hairy apically; pappus a short crown of minute scales, or vestigial or lacking; achenes subcylindric, the ventral face with 3–5 narrow ribs, the dorsal face smooth and convex.



1. Heads radiate; disk corollas 5-lobed; involucre 11–25 mm in diameter ..... *C. recutita*  
 — Heads discoid; disk corollas 4-lobed; involucre 4–10 mm in diameter ... *C. suaveolens*

***Chamomilla recutita* (L.) Rauschert**  
*Chamomile*. [*Matricaria chamomilla* L.]. Annual herbs; stems 0.2–4 (6) dm tall, erect or ascending, branched above; herbage glabrous or puberulent; leaves 2–6 cm long; heads solitary or more commonly few to many and corymbosely arranged; involucre saucer shaped, 3–4 mm high, 11–25 mm wide, the bracts subequal, the margins broadly hyaline, the midstripe greenish to brownish; rays 10–20, white, 4–10 mm long. Moist disturbed soils at low to moderate elevations in Salt Lake and Wasatch counties; adventive from Europe; 2 (0).

***Chamomilla suaveolens* (Pursh) Rydb.**  
*[Matricaria matricarioides* (Less.) Porter]. Annual herbs; stems 0.4–4 dm tall, erect or ascending, branched from the base or simple; herbage glabrous or pubescent; leaves 1–5 (9) cm long; heads few to many, paniculately arranged; involucre saucer shaped, 2–6 mm

high, 4–10 mm wide, the bracts subequal to somewhat imbricate, the margins hyaline, the midstripe greenish; rays lacking; disk flowers 4-lobed. Disturbed sites at 1310 to 2810 m in Box Elder, Cache, Carbon, Rich, Salt Lake, Sevier, Utah, and Weber counties; adventive from Europe; 16 (0).

#### CHRYSANTHEMUM L.

Perennial herbs from a rhizome or a caudex, with watery juice; stems erect or nearly so; leaves alternate, serrate to pinnatifid; heads solitary or few to numerous in open corymbose clusters; involucral bracts imbricate, in 2–4 series, greenish or straw colored, the margins brownish-scarious; receptacle naked; ray flowers white, numerous, pistillate, fertile, or lacking; disk flowers numerous, perfect, fertile, yellow; pappus lacking or a short crown; style branches flattened; achenes several nerved, beakless, glabrous.

1. Leaves finely serrate; heads usually numerous, small, commonly rayless .. *C. balsamita*  
 — Leaves coarsely serrate or pinnatifid; heads larger, fewer, commonly with rays ..... 2  
 2(1). Heads solitary or few; involucre 7–10 mm high; rays 1–2 cm long; leaves serrate to more or less once pinnatifid ..... *C. leucanthemum*  
 — Heads several to numerous; involucre 3–4.5 mm high; rays 2–6 mm long .....  
 ..... *C. parthenium*

***Chrysanthemum balsamita* L.** Costmary. [*Balsamita major* Desf.]. Perennial herbs, from a caudex, commonly 5–10 (12) dm tall; stems strigose, at least above; leaves petiolate below, sessile or subsessile above, the blades 0.9–10 (15) cm long, 0.6–5 (8) cm wide, elliptic to oblanceolate, finely serrate, strigose; heads numerous, corymbose; involucre 3.7–4.6 mm high, 6–8 mm wide, the bracts oblong, sparingly strigose, the tip hyaline; ray flowers (when present) 4–6 mm long. Fields, roadsides, and cemeteries at 1370 to 2135 m Salt Lake, Summit, Tooele, and Utah counties; escaped from cultivation, now widely established in the United States; 5 (i).

***Chrysanthemum leucanthemum* L.** Oxeye-daisy. [*Leucanthemum vulgare* Lam.] Perennial rhizomatous or subrhizomatous herbs, commonly 2–8 (10) dm tall; stems glabrous or

nearly so, mainly simple; leaves petiolate below, becoming smaller and sessile above, the blades 0.8–5 cm long, oblanceolate to obovate or linear, serrate, crenate, or pinnately lobed, glabrous or villosulose; heads solitary; involucre 7–10 mm high, 15–23 mm wide, the bracts lance-ovate to oblong-linear, with brown margins, hyaline apically; rays mainly 15–30, white, 10–22 mm long; pappus none. Roadsides, fields, and other disturbed sites at 1525 to 2135 m in Salt Lake, Utah, Wasatch, and Weber counties; widespread in North America; adventive from Eurasia; 6 (0).

***Chrysanthemum parthenium* (L.) Bernh.**  
*[Matricaria parthenium* L.; *Leucanthemum parthenium* (L.) Gren. & Godron; *Pyrethrum parthenium* (L.) Sm.; *Tanacetum parthenium* (L.) Schultz-Bip.]. Perennial herbs with caudex and taproot; commonly 3–9 dm tall;

stems glabrous, or puberulent above; leaves petiolate, becoming smaller, but still petiolate above, the blades 0.5–8 cm long, 0.6–4.5 (6) cm wide, pinnatifid or doubly so; heads several to numerous, the inflorescence corymbose; involucre 3–4.5 mm high, 7–10 mm wide, the bracts oblong, with a dark center, otherwise scarious except the tip hyaline; rays 10–20, white, 4–8 mm long; pappus a crown or none. Cultivated ornamental, escaping and persisting at 1525 to 1950 m in Carbon, Salt Lake, Utah, and Weber counties; widely established in the United States; adventive from Europe; 5 (0).

CHRYSOETHAMNUS Nutt.

Shrubs with white bark, or the surface obscured by a tomentum, this often glandular-resinous; leaves alternate, linear to oblong, or lanceolate, sessile, entire; heads white or yellow, discoid, narrow, in contracted to open paniculate inflorescences; flowers perfect, fertile; involucre bracts imbricate, more or less keeled, in 4 or 5 vertical or obscure ranks, chartaceous or coriaceous, or the tip herbaceous; receptacle naked; style branches flattened; achenes slender, flattened, angled, or terete, hairy or glabrous; pappus of numerous capillary bristles.

1. Flowers white; leaves terete; plants of western tier of counties (except Iron and Washington) ..... *C. albidus*  
— Flowers yellow; leaves various, but, if terete, of Washington County or rarely elsewhere ..... 2
- 2(1). Leaves terete, resinous punctate; stems more or less fastigiate; plants of Washington County ..... *C. paniculatus*  
— Leaves commonly more or less flattened, resinous-punctate or not; stems not especially fastigiate; plants of broad or other distribution ..... 3
- 3(2). Stems obscured by a tomentum, this often impregnated with resinous-glandular material ..... 4  
— Stems glabrous or puberulent, the surface readily apparent ..... 5
- 4(3). Involucral bracts long-attenuate, membranous; inflorescence more or less racemose ..... *C. parryi*  
— Involucral bracts obtuse to acute, rarely attenuate, but, if so, chartaceous; inflorescence cymose ..... *C. nauseosus*
- 5(3). Leaves lanceolate to lance-oblong, not contorted; shrubs mainly 6–20 dm tall; plants of the Uinta and Navajo basins ..... *C. linifolius*  
— Leaves linear, oblong, or lanceolate, but, if lanceolate, twisted and shrubs mainly less than 6 dm tall; distribution various ..... 6
- 6(5). Achenes hairy ..... 7  
— Achenes lacking hairs, sometimes glandular, or, if sparingly hairy, the involucre over 10 mm long ..... 8
- 7(6). Involucral bracts acuminate-cuspidate; leaves 1–2 mm wide ..... *C. greenii*  
— Involucral bracts acute to obtuse; leaves various ..... *C. viscidiflorus*
- 8(6). Flowers 10–12 mm long, surpassed by the pappus; plants of Emery, Wayne, and San Juan counties ..... *C. pulchellus*  
— Flowers 7–9 mm long, surpassing or subequal to the pappus; distribution various ..... 9
- 9(8). Involucral bracts strongly ranked; involucre 9.2–13 mm long ..... *C. depressus*  
— Involucral bracts not strongly ranked; involucre 6.2–7.5 mm long ..... *C. vaseyi*

***Chrysothamnus albidus* (Jones) Greene** Alkali Rabbitbrush; White Rabbitbush. [*Bige-  
lovia albida* Jones]. Shrubs, mainly 5–10 dm  
tall, more or less fastigiately branched, white  
barked, glabrous, resinous-viscid, aromatic;  
leaves 0.5–3.5 cm long, terete, 0.5–1 mm  
thick, glandular-punctate, mucronate,  
crowded, often with axillary fascicles; heads  
clustered at branchlet apices; involucre  
6.8–9 mm high, 3–7 mm wide, the bracts ob-  
scurely 4- to 5-ranked, the outer ones lance-  
ovate, thickened in lower half, abruptly sub-  
ulate-attenuate, the inner oblong, acuminate  
to acute, the margin hyaline, glandular to to-  
mentose; corollas white, 6–7.5 mm long; achenes  
4–4.5 mm long, pilose and glandular;  
pappus abundant. Local in salt grass, pickle-  
weed, and alkali-succaton communities at  
1450 to 1650 m in Beaver, Box Elder, Juab,  
Millard, and Tooele counties; California, Ne-  
vada; 8 (iii).

***Chrysothamnus depressus* Nutt.** Dwarf  
Rabbitbrush. Low, spreading shrubs, the as-  
cending to erect, subherbaceous stems 0.6–3  
dm tall, white barked, scabrous-puberulent or  
glandular-puberulent; leaves 0.4–2 cm long,  
1–4 (5) mm wide, flat, narrowly lanceolate to  
oblanceolate or spatulate, flat, scabrous-  
puberulent, obtuse, rounded or sharply apicu-  
late; heads clustered at branch apices; in-  
volucre 9.2–13 mm high, 4.5–7 mm wide,  
the bracts in 4 or 5 definite vertical ranks,  
keeled, lance-attenuate, the subulate tip soft,  
the outer more or less herbaceous (sometimes  
suffused with purple) and the inner with  
broad hyaline margins; corollas yellow, 7.5–9  
mm long; achenes (5) 6–7 mm long, glabrous  
or sparingly stipitate-glandular; pappus off-  
white to brownish, abundant. Sagebrush, salt  
desert shrub, juniper, pinyon-juniper, moun-  
tain brush, ponderosa pine and alpine fir  
communities at 1550 to 2900 m in Carbon,  
Duchesne, Emery, Garfield, Iron, Juab, Kane,  
Millard, Piute, San Juan, Sanpete, Sevier,  
Summit, Uintah, Utah, Wasatch, Washington,  
and Wayne counties; Colorado, New Mexico,  
Arizona, and Nevada; 34 (iv).

***Chrysothamnus Greenei* (Gray) Greene**  
Greene Rabbitbrush. Low, ascending to erect  
shrubs, with subherbaceous stems from a  
woody crown, mainly 1–3.5 dm tall, white-  
barked, glabrous; leaves 0.3–3.5 cm long,  
0.8–1.2 mm wide, flat, linear, glabrous or

scabrous-ciliate; heads numerous, corym-  
bously clustered at branch tips; involucre  
5–7.1 mm high, 2.5–4 mm wide, the bracts  
obscurely ranked, the outer ones herbaceous-  
thickened near the tip, gradually acuminate-  
cuspidate, the inner ones abruptly narrowed,  
glabrous or more or less tomentose, narrowly  
if at all hyaline-margined; corollas yellow,  
3.5–4.8 mm long; achenes 3.3–4 mm long, pi-  
lose. Rabbitbrush, black sagebrush, shadscale,  
winterfat, sagebrush, and pinyon-juniper  
communities at 1280 to 2745 m in Carbon,  
Duchesne, Emery, Garfield, Grand, Juab,  
Millard, Piute, Tooele, Uintah, Utah, and  
Wayne counties; Colorado, New Mexico, Ari-  
zona, and Nevada; 53 (vi). This entity forms  
intermediates with phases of *C. viscidiflorus*.

***Chrysothamnus linifolius* Greene** Spread-  
ing Rabbitbrush. Tall shrubs, the branches  
erect-ascending, mainly 8–20 (35) dm tall,  
white barked, glabrous; leaves 0.9–7.7 cm  
long, 1–9 mm wide, flat, plane (not contorted  
or rarely somewhat so), thick, oblong to ellip-  
tic or narrowly lanceolate, glabrous,  
scabrous-ciliate, attenuate to acute; heads nu-  
merous, corymbously arranged at branch tips;  
involucre 4.3–7.2 mm long, 1.8–3 mm wide,  
the bracts indistinctly ranked, the outer dis-  
tinctly herbaceous at tip, the inner often  
merely glandular thickened at midrib, all ob-  
tuse to rounded, glabrous; corollas yellow,  
4.5–5.8 mm long; achenes 2.1–2.8 mm long,  
pilose. Stream banks and terraces, irrigation  
canals, seeps and springs in riparian commu-  
nities at 1130 to 2535 m in Carbon, Daggett,  
Duchesne, Emery, Garfield, Grand, Kane,  
San Juan, Sanpete, Sevier, Uintah, and  
Wayne counties; Montana to Arizona and  
New Mexico; 54 (xvii).

***Chrysothamnus nauseosus* (Pallas) Britt.**  
Rubber Rabbitbrush. Low to tall shrubs, the  
branches erect-ascending, mainly 2–20 (30)  
dm tall, the bark obscured by a tomentum,  
this often resinous-glandular impregnated;  
leaves 0.6–7 (10) cm long, 0.5–5 (10) mm  
wide, 1- to 3-nerved, tomentose to glabrate  
or glabrous, subcylindric to flat, if the latter  
then commonly plane, linear to narrowly ob-  
long, acute to apiculate apically; heads nu-  
merous, in terminal paniculate cymes; in-  
volucre (6) 6.5–11.5 (13) mm high, 1.5–7.2  
mm wide, the bracts obscurely to definitely  
ranked, the outer ones sparingly tomentose to



glabrous, the inner commonly glabrous, oblong, chartaceous to more or less herbaceous-thickened, obtuse to acute or shortly acuminate apically; corollas yellow or yellow-orange, 6–10.3 (12) mm long; achenes 2.5–5.5 mm long, glabrous or hairy. The *nauseosus*

complex in Utah is represented by a diverse assemblage of more or less geographically and ecologically segregated races, which are placed in some 14 varieties. The following arbitrary key will serve to identify most specimens.

1. Shrubs usually 3 dm tall or lower; plants local endemics in Piute, Sanpete, Sevier, Carbon, Emery, Daggett, and Duchesne counties ..... 2
- Shrubs usually more than 3 dm tall, seldom lower, but then of different distribution ..... 4
- 2(1). Involucres glabrous, 8.5–9.5 mm high; plants of Emery, Carbon, Wasatch and Duchesne counties ..... *C. nauseosus* var. *psilocarpus*
- Involucres tomentose or glabrous, 10–12 (13.5) mm high; plants of Sanpete, Sevier, and Piute counties ..... 3
- 3(2). Involucres glabrous; corollas 7.8–9 mm long; plants local on Arapien shale in Sanpete and Sevier counties ..... *C. nauseosus* var. *iridis*
- Involucres tomentose; corollas 10–12 mm high; plants local in Piute County ...  
..... *C. nauseosus* var. *glareosus*
- 4(1). Achenes and ovaries glabrous ..... 5
- Achenes and ovaries pilose ..... 8
- 5(4). Flowers 5–8 mm long; involucres 7–8.5 (9) mm long, 1.5–3 mm wide (when pressed) ..... *C. nauseosus* var. *abbreviata*
- Flowers 8.3–10 mm long; involucres 9–11 mm long, 3.7–7 mm wide (when pressed) ..... 6
- 6(5). Involucres subcylindric; plants of dunes and deep sands of western Utah and in the Uinta Basin ..... *C. nauseosus* var. *turbinatus*
- Involucres tapering to the base; plants of south central and southeastern Utah ..... 7
- 7(6). Achenes 5–5.5 mm long; plants low, commonly less than 5 dm tall; known from San Juan and Emery counties ..... *C. nauseosus* var. *bigelovii*
- Achenes 2.5–4 mm long; plants taller, commonly over 5 dm tall; known from Kane County ..... *C. nauseosus* var. *nitidus*
- 8(4). Involucres over 10 mm long; corollas 9.5–10.5 mm long ..... 9
- Involucres 6.5–8.6 (9.5) mm long (to 11 mm long in var. *junceus*); corollas 5–8.6 (10) mm long ..... 10
- 9(8). Involucres cylindric, the bracts neither strongly keeled nor ranked; plants of dune areas in western and northeastern Utah ..... *C. nauseosus* var. *turbinatus*
- Involucres tapering, clavate, the bracts strongly keeled and aligned; plants of Kane County ..... *C. nauseosus* var. *arenarius*
- 10(8). Leaves 3–5 (10) mm wide; plants of central to north central Utah .....  
..... *C. nauseosus* var. *salicifolius*
- Leaves 0.5–3 mm wide; plants of various distribution ..... 11
- 11(10). Corolla lobes commonly long-pilose (glabrate in age); leaves often deciduous by anthesis; plants of southeastern Utah ..... *C. nauseosus* var. *junceus*
- Corolla lobes glabrous; leaves present or absent at anthesis; distribution various ..... 12

- 12(11). Corolla lobes 0.4–0.9 mm long ..... *C. nauseosus* var. *gnaphaloides*  
 — Corolla lobes 1–2 mm long ..... 13
- 13(12). Leaves (1) 3- to 5-nerved, commonly 1–3 mm wide ..... *C. nauseosus* var. *glabratus*  
 — Leaves 1-nerved, commonly 0.5–1.5 mm wide ..... 14
- 14(13). Leaves and/or stems usually grayish or whitish tomentose or green, not  
 especially yellow-green; involucre more or less tomentose .....  
 ..... *C. nauseosus* var. *albicaulis*  
 — Leaves and/or stems usually yellowish-green, the tomentum commonly  
 resinous-matted; involucre glabrous ..... *C. nauseosus* var. *consimilis*

**Var. *abbreviatus* (Jones) Welsh** comb. nov.  
 [based on: *Bigelovia leiosperma* var. *abbreviata* Jones Proc. Calif. Acad. II, 5: 693. 1895; type from Clear Creek Canyon, Sevier County; *C. nauseosus* var. *leiosperma* (Gray) Hall; *C. nauseosus* ssp. *leiospermus* (Gray) H. & C.; *Bigelovia leiosperma* Gray, type from St. George.] Blackbrush, Grayia, shadscale, black sagebrush, Vancleavea, pinyon-juniper, and ponderosa pine communities at 1070 to 2745 m in Emery, Garfield, Grand, Kane, Millard, Piute, Sevier and Washington counties; Nevada, California; 15 (v). The materials from Emery and Grand counties have leaves that are very slender and subterete. The condition is presumably derived from introgression with var. *bigelovii*.

**Var. *albicaulis* (Nutt.) Rydb.** [*C. nauseosus* var. *albicaulis* Nutt.]. Saltgrass, sagebrush, pinyon-juniper, and ponderosa pine communities at 1310 to 2290 m in Box Elder, Cache, Carbon, Juab, Kane, Millard, Morgan, Salt Lake, San Juan, Uintah, Utah, Wasatch, and Weber counties; Oregon to Wyoming, south to California, Nevada, and New Mexico; 24 (i). This taxon forms intermediates with var. *glabratus*. In low elevation phases of saline substrates the stems are white-pannose.

**Var. *arenarius* (L.C. Anderson) Welsh** comb. nov. [based on: *C. nauseosus* ssp. *arenarius* L.C. Anderson Phytologia 38: 311. 1978.]. Sagebrush, juniper, and pinyon-juniper communities at 1675 to 1830 m in Kane County; Arizona; 3 (i). This is a plant of deep sandy alluvium.

**Var. *bigelovii* (Gray) Hall** [*C. nauseosus* ssp. *bigelovii* (Gray) H. & C.; *Linosyris* (*Chrysothamnus*) *bigelovii* Gray]. Grayia and pinyon-juniper communities 1460 to 1950 m in Emery and San Juan (Lavender Mesa) counties; Arizona, Colorado, New Mexico; 2 (i). More collections of this entity are required.

**Var. *consimilis* (Greene) Hall** [*C. nauseosus* ssp. *consimilis* (Greene) H. & C.; *C. consimilis* Greene]. Saline meadows, riparian zones, and terraces in saltgrass-alkali saccaton, shadscale, sagebrush, rabbitbrush, mountain brush, pinyon-juniper, and ponderosa pine communities at 1280 to 3000 m in all Utah counties except Grand and San Juan; Oregon to Wyoming, south to California, Arizona and New Mexico; 100 (xxv). This is the common narrow-leaved phase with cone-shaped panicles. They occur frequently in saline moist sites, such as the travertine mounds at Monroe Hot Springs.

**Var. *glabratus* (Gray) Cronq.** [*Bigelovia graveolens* var. *glabrata* Gray; *C. nauseosus* ssp. *graveolens* (Gray) Piper; *C. nauseosus* var. *graveolens* (Gray) Hall]. Desert willow-baccharis, willow-cottonwood, greasewood-tamarix, sagebrush, shadscale, mountain brush, and ponderosa pine communities at 750 to 2475 m in Summit, Wasatch, Utah, Sanpete, Sevier, Piute, Iron, and Washington counties, and in all counties east of those; Idaho to North Dakota, south to Arizona, and New Mexico; 88 (xxiii).

**Var. *glareosus* (Jones) Welsh** stat. nov. [based on: *Bigelovia glareosa* Jones Zoe 2: 247. 1891, type from Marysville; *C. nauseosus* ssp. *glareosa* (Jones) H. & C.]. The type specimen is lost, and the ultimate disposition of this taxon is uncertain; it should be sought in the canyon north of Marysville, on Tertiary igneous substrates; endemic; 0 (0).

**Var. *gnaphaloides* (Greene) Hall** [*C. speciosus* var. *gnaphaloides* Greene; *C. nauseosus* ssp. *hololeucus* (Gray) H. & C., in part]. Shadscale, pigmy sagebrush, rabbitbrush, sagebrush, and pinyon-juniper communities at 1070 to 2380 m; known in all Utah counties except Box Elder, Daggett, Duchesne, Kane, Morgan, Rich, Summit, and Wayne,

and likely in them also; California, Nevada, and Arizona (?); 73 (vii). This taxon is a near ally of *ssp. hololeucus* (Gray) H. & C., and should that taxon be placed within a quadrimonial, then the var. *gnaphaloides* would be placed within it. However, no such combination is implied or proposed herein.

**Var. *iridis* (L.C. Anderson) Welsh** stat. nov. [based on: *C. nauseosus* *ssp. iridis* L.C. Anderson Great Basin Nat. 41:311. 1981, type from Rainbow Hills, Sevier County]. Rabbitbrush-sagebrush community on an incipient seep in Arapien shale at ca 1980 m in Sevier Co.; endemic; 2 (i).

**Var. *junceus* (Greene) Hall** [*C. nauseosus* *ssp. junceus* (Greene) H. & C.; *Bigelovia juncea* Greene]. Blackbrush, shadscale, rabbitbrush, matchweed, and pinyon-juniper communities at 1220 to 1800 m in Emery, Garfield, Grand, Kane, San Juan and Wayne counties; Arizona; 18 (iv). The nonglandular, clear straw-colored, long involucres with bracts usually aligned are distinctive of this variety.

**Var. *nitidus* (L.C. Anderson) Welsh** stat. nov. [based on: *C. nauseosus* *ssp. nitidus* L.C. Anderson Phytologia 38: 313. 1978]. Vanclevea-ephedra community at about 1250 m in Kane County; Arizona; 1 (0). This variety has the general aspect of vars. *bigelovii* and *abbreviata*. It is a taller plant than either, and differs otherwise as set forth in the key.

**Var. *psilocarpus* Blake** [*C. nauseosus* *ssp. psilocarpus* (Blake) L.C. Anderson]. Sagebrush and salina wildrye communities at 1925 to 2290 m in Carbon, Duchesne, Emery, and Wasatch counties; endemic; 5 (0). These peculiar low shrubs occasionally produce taller intermediates with var. *glabratus* (q.v.)

**Var. *salicifolius* (Rydb.) Hall** [*C. salicifolius* Rydb., type from Strawberry Valley; *C. nauseosus* *ssp. salicifolius* (Rydb.) H. & C.]. Sagebrush, pinyon-juniper, mountain brush, and aspen communities at 1310 to 2870 m in Box Elder, Carbon, Duchesne, Emery, Juab, Salt Lake, Sanpete, Sevier, Summit, Tooele, Utah, and Wasatch counties; endemic; 19 (iii). This entity forms intermediates with var. *glabratus*, and might represent nothing more than a broad-leaved extension of that taxon.

**Var. *turbinatus* (Jones) Blake** [*Bigelovia turbinata* Jones, type from Kane County; *C.*

*nauseosus* *ssp. turbinatus* (Jones) H. & C.]. Rabbitbrush, saltbush, ephedra, juniper, and greasewood communities at 1370 to 1710 m in Beaver, Iron, Juab, Kane, Millard, and Uintah counties; Nevada(?); 10 (iii). Both glabrous and pilose achenes occur in this distinctive taxon. It shares the feature of villous corolla lobes with the sand-loving var. *junceus* of the Navajo Basin. The Uintah Basin materials differ in the more keeled and attenuate involucres and flowers that are more exerted from the involucre.

***Chrysothamnus paniculatus* (Gray) Greene** [*Bigelovia paniculata* Gray]. Tall shrubs, the branches subfastigate, mainly 6–20 dm tall, the bark green, becoming tan to gray in age, resinous-punctate; leaves 0.4–3 cm long, about 0.5 mm wide, linear-filiform, terete, mucronate apically; heads numerous, in usually conic panicles; involucres 4.8–6.5 mm high, 2–3 mm wide, the bracts indistinctly ranked, chartaceous-indurate, scarcely if at all glandular, thickened at midrib, obtuse, glandular; corollas yellow, 5.5–6 mm long; achenes 1.8–3.4 mm long, pilose. Roadsides, stream banks, terraces, and slopes in creosote bush, Joshua tree, and baccharis communities at 670 to 1220 m in Washington County; Nevada, Arizona, California; 9 (iii). The plants begin to flower in October and continue into November.

***Chrysothamnus parryi* (Gray) Greene** Low to moderate shrubs, the branches not especially fastigate, mainly 2–6 dm tall, the bark pannose-tomentose or the tomentum glandular-resinous; leaves 0.6–6 (8) cm long, 1–2 mm wide, 1- to 3-nerved, green, viscid or sometimes tomentulose, flat, usually plane, linear to narrowly oblong; heads several to many, the inflorescences tending to be elongate and subracemose; involucres 9–14.5 mm high, 4–8 mm wide, the bracts obscurely to definitely ranked, puberulent to glabrous, the outer usually with elongate herbaceous tips, the inner chartaceous, with glandular-thickened midrib, abruptly to gradually acuminate-attenuate or attenuate; corollas yellow or creamy yellow, 8–10 mm long; achenes 3.3–7.5 mm long, pilose. Plants of the *parryi* complex form hybrid derivatives with phases of *C. nauseosus*, and with other named segregates within the complex. Except for varieties *parryi* and *nevadensis*, only arbitrary



segregation appears possible. Thus, the conservative treatment as outlined be-

low seems to best reflect the nature of *C. parryi* in Utah.

1. Flowers usually more than 10 per head ..... *C. parryi* var. *parryi*
- Flowers commonly 5–9 per head ..... 2
- 2(1). Involucral bracts mainly 24–28; plants of southwestern Utah .....  
..... *C. parryi* var. *nevadensis*
- Involucral bracts mainly 12–22; plants of south central, central, and north-eastern Utah ..... *C. parryi* var. *attenuatus*

**Var. *attenuatus* (Jones) Kittell in Tidestr. & Kittell** [*Bigelovia howardii* var. *attenuata* Jones, type from near Marysville; *C. parryi* ssp. *attenuatus* (Jones) H. & C.; *C. affinis*. A. Nels.; *C. parryi* ssp. *affinis* (A. Nels.) L.C. Anderson; *Linosyris howardii* Parry in Gray; *C. parryi* ssp. *howardii* (Parry) H. & C.; *C. parryi* var. *howardii* (Parry) Kittell in Tidestr. & Kittell]. Meadows, sagebrush, juniper, pinyon-juniper, mountain brush, ponderosa pine, and aspen communities at 1740 to 2930 m in Beaver, Carbon, Daggett, Duchesne, Garfield, Grand, Iron, Kane, Piute, Sanpete, Sevier, Uintah, Utah, Wasatch, and Wayne counties; Wyoming and Nebraska, south to Arizona and New Mexico; 55 (xv). The *howardii* phase differs supposedly in the bracteate leaves overtopping the inflorescence and in the pale colored flowers; both characters fail as diagnostic features.

**Var. *nevadensis* (Gray) Kittell in Tidestr. & Kittell** [*Linosyris howardii* var. *nevadensis* Gray; *C. parryi* ssp. *nevadensis* (Gray) H. & C.]. Sagebrush, juniper, pinyon-juniper, mountain brush, and ponderosa pine communities at 1830 to 2565 m in Beaver, Iron, Millard, and Washington counties; Arizona; 10 (ii). The var. *nevadensis* differs only in degree from var. *attenuatus*, with which it is contiguous, if not partially sympatric, to the east. Should the two be combined, then the correct name will be var. *nevadensis*, since that name has priority in rank. Plants with leaves overtopping the inflorescence occur; technically they would key to the *howardii* phase of var. *attenuatus*.

**Var. *parryi* [*Linosyris parryi* Gray]**. Ponderosa pine and spruce-fir communities at 2075 to 2625 m in Beaver, Emery (?), Garfield, Kane, Millard, and Washington counties; Wyoming, Colorado, New Mexico, and Nevada; 9 (ii).

***Chrysothamnus pulchellus* (Gray) Greene**

Low to moderately tall shrubs, the branches not fastigiate, mainly 5–10 dm tall, the bark white, becoming tan or brown in age, glabrous or puberulent above; leaves 0.4–3 cm long, 1–2 mm wide, linear to narrowly oblanceolate, glabrous or puberulent, flat or revolute, mucronate; heads few to many, in corymbose panicles; involucre 11.5–15 mm high, 4.5–6 mm wide, the bracts distinctly aligned, more or less herbaceous toward the apex, glandular, attenuate to sharply acute; corollas yellow, 9–10 (14) mm long; achenes 3.8–4.5 mm long, sparingly hirsute and glandular. Shadscale, blackbrush, ephedra, pinyon-juniper, and ponderosa pine communities at 1370 to 2350 m in Emery, Wayne, and San Juan counties; Arizona to Kansas, south to Mexico; 4 (i). Our material belongs to var. *baileyi* (Woot. & Standl.) Blake [ssp. *baileyi* (Woot. & Standl.) H. & C.].

***Chrysothamnus vaseyi* (Gray) Greene** [*Bigelovia vaseyi* Gray]. Low shrubs, mainly 1–3 dm tall, the branches not especially fastigiate, the bark green, becoming whitish tan or finally gray in age, puberulent; leaves 0.3–3.7 cm long, 0.8–3 mm wide, linear to oblong or narrowly oblanceolate, glabrous or glandular, flat, plane, mucronate; heads numerous in compact terminal cymes; involucre 6.2–7.5 mm high, 3–6 mm wide, the bracts more or less aligned, commonly herbaceous or thickened near the apex, glandular, obtuse, the margins fimbriate-hyaline; corolla yellow, 4.8–7 mm long; achenes 2.6–4 mm long, glabrous. Meadows, sagebrush, rabbitbrush, juniper, mountain brush, and ponderosa pine communities at 1675 to 2900 m in Beaver, Carbon, Emery, Garfield, Juab, Kane, Iron, Piute, San Juan, Sanpete, Sevier, and Utah counties; Nevada, Wyoming, Colorado, New Mexico; 21 (ii).

*Chrysothamnus viscidiflorus* (Hook.) Nutt. Low to moderate shrubs, mainly 2–10 dm tall, the branches fastigiate or not, the bark green to tan or white, finally gray in age, glabrous or puberulent; leaves 0.3–4.5 (6) cm long, 0.5–4 (10) mm wide, 1- to 5-nerved, linear to oblong, elliptic or oblanceolate, often twisted, mucronate; heads numerous, in compact to open terminal cymes; involucre 5–7.5 mm high, 2–4 mm wide, the bracts not well aligned, commonly herbaceous or thickened near the apex (at least the outer), glandular or puberulent, obtuse, or abruptly acute, the margin narrow, hyaline; corollas yellow, 3.8–6 mm long; achenes 3–4 mm long, pilose. The *viscidiflorus* complex is separable into two groups on the basis of pubescence of upper stems or the lack of pubescence. The segregation is not complete, because pubescence or its absence is not an absolute criterion. There is a cline in the amount of pubescence from abundant to few (or none), and the adoption of a position that

one hair equals pubescence and, therefore one part of the complex and not the other, will lead to absurdity. Within the hairy phase of the complex are two more or less distinctive but largely sympatric varieties. The “glabrous” portion of the species is more difficult to separate into its constituent entities. Anderson (Great Basin Nat. 40: 117–20, 1980) reviewed this portion of the complex; concluding that there are three taxa involved, i.e. ssp. *axillaris*, ssp. *viscidiflorus* var. *viscidiflorus*, and ssp. *viscidiflorus* var. *stenophyllus*. Only arbitrary separation of the three is possible, and segregation of the *axillaris* phase is problematical. In my view it is not practical to attempt recognition of more than two taxa, i.e. var. *stenophyllus* (including *axillaris*) and var. *viscidiflorus*. They are all recognized herein at varietal level, but probably would best fit within an expanded ssp. *viscidiflorus* as varieties (a course not intended or implied herein). The following key will allow for identification of most specimens.

1. Stems (at least above) and/or leaves puberulent to hispidulous ..... 2
- Stems and leaves glabrous, or the leaves ciliate, or rarely with a few short hairs on stems or with glandular excrescences in the inflorescence ..... 3
- 2(1). Leaves 0.5–2 mm wide; stems finely puberulent above .....  
..... *C. viscidiflorus* var. *puberulus*
- Leaves 2–5 mm wide; stems hispidulous-puberulent above .....  
..... *C. viscidiflorus* var. *lanceolatus*
- 3(1). Leaves 0.5–1.5 mm wide; plants mainly 2–3 dm tall .....  
..... *C. viscidiflorus* var. *stenophyllus*
- Leaves mainly 1–4 mm wide (or more); plants mainly 3–10 dm tall .....  
..... *C. viscidiflorus* var. *viscidiflorus*

**Var. *lanceolatus* (Nutt.) Greene** [*C. lanceolatus* Nutt.; *C. viscidiflorus* ssp. *lanceolatus* (Nutt.) H. & C.]. Sagebrush, pinyon-juniper, mountain brush, aspen, Douglas fir, lodgepole pine, spruce-fir, and alpine meadow communities at 1375 to 3200 m in all Utah counties except Kane and Washington, and likely there also; British Columbia to South Dakota, and south to California, Nevada, Arizona, and New Mexico; 112 (xii).

**Var. *puberulus* (D.C. Eaton) Jepson** [*Linosyris viscidiflora* var. *puberula* D.C. Eaton; *C. viscidiflorus* ssp. *puberulus* (D.C. Eaton) H. & C.]. Rabbitbrush, black sagebrush,

shadscale, sagebrush, pinyon-juniper and ponderosa pine communities at 1460 to 2200 m in the western tier of counties, east to Piute, Sevier, Emery, Carbon, Utah, and Salt Lake counties; Oregon and Idaho south to California, Nevada, and Arizona; 44 (vii).

**Var. *stenophyllus* (Gray) Hall** [*Bigelovia douglasii* var. *stenophylla* Gray; *C. viscidiflorus* ssp. *stenophylla* (Gray) H. & C.; *C. axillaris* Keck; *C. viscidiflorus* ssp. *axillaris* (Keck) L.C. Anderson]. Ephedra, blackbrush, rabbitbrush, sagebrush, galleta, shadscale, and pinyon-juniper communities at 1280 to 2075 m in all Utah counties except Piute, Sevier,

Sanpete, Carbon, Duchesne, Wasatch, Utah, Salt Lake, Davis, Weber, Morgan, Summit, and Cache; Oregon to Wyoming and south to California,, Nevada, Arizona, and Colorado; 34 (vii).

Var. *viscidiflorus* [*Crinitaria viscidiflora* Hook.; *C. viscidiflorus* var. *pumilus* authors, not (Nutt.) Jeps. (?). Rabbitbrush, shadscale, sagebrush, pinyon-juniper, mountain brush, white fir, ponderosa pine, and aspen communities at 1460 to 2900 m in all or nearly all Utah counties; Washington to Nebraska, south to California, Nevada, Arizona, and Colorado; 100 (xx). The var. *viscidiflorus* forms intermediates with all other taxa in the species, and with *C. greenei* also.

CICHORIUM L.

Perennial herbs, with milky juice, from taproots; leaves alternate, toothed to pinnatifid; heads sessile or subsessile, numerous, borne in clusters at nodes of a spicate, simple, or branched inflorescence; involucre bracts biseriate, the outer shorter; corollas all ray-like, perfect; pappus of 2 or 3 series of scales, sometimes minute; achenes angular or somewhat compressed, glabrous.

*Cichorium intybus* L. Chickory. Plants 3–10 dm tall or more, hirsute or glabrous; lower leaves petiolate, the blades 6–20 cm long, 1–5 (7) cm wide, sinuate-dentate to runcinate-pinnatifid, becoming smaller and sessile upward, some finally subentire; heads large and showy, 1–3 per node of inflorescence; flowers pure blue, rarely white; involucre 9–15 mm high, the outer bracts chartaceous at base, herbaceous apically; achenes 2–3 mm long. Roadsides and disturbed sites at 1340 to 2135 m in Duchesne, Iron, Kane, Salt Lake, Tooele, and Utah counties; widespread in North America; native of Eurasia; 8 (i). The herb *C. endiva* L. is grown in Utah; the extent is not known.

CIRSIIUM Mill.

Annual, biennial, or perennial, caulescent or acaulescent, spiny herbs from taproots, with caudices or rhizomes in some, the juice watery; leaves basal and cauline, alternate; heads solitary to several; involucre bracts in several series, subequal to imbricate, some or most of them spine tipped; receptacle densely bristly; corollas all discoid, pink, purple, red, or creamy white, perfect or imperfect; pappus of plumose bristles (or those of the outermost flowers merely barbellate); style with a thickened minutely hairy ring below the nearly connate lobes; achenes glabrous, flattened or 4-angled, 4- to many-nerved. **Note:** This is a particularly complex genus taxonomically, with both introduced and indigenous species. The indigenous members are especially difficult, due in part to hybridization, mainly within species groups. The following treatment is tentative, but represents an attempt to categorize the variation present in Utah plants and to provide a legitimate name for each. Several taxa previously reported from the state are excluded, or they are treated within the constituent taxa. All involucre measurements are in pressed condition!

MOORE, R. J. AND C. FRANKTON. 1963a. Cytotaxonomic notes on some *Cirsium* species of the western United States. *Canad. J. Bot.* 41: 1553–1567.  
———. 1963b. A clarification of *Cirsium foliosum* and *Cirsium drummondii*. *Canad. J. Bot.* 42: 451–461.  
———. 1965. Cytotaxonomy of *Cirsium hookerianum* and related species. *Canad. J. Bot.* 43: 597–613.  
———. 1973. The *Cirsium arizonicum* complex of the southwestern United States. *Canad. J. Bot.* 52: 543–551.  
PETRAK, F. 1917. Die nordamerikanischen Arten der Gattung *Cirsium*. *Beih. Bot. Centralbl.* (Abt. 2), 35: 223–567.

- 1. Flowers mainly imperfect; heads unisexual; plants perennial, from rhizomes; introduced weed of consequence ..... *C. arvense*
- Flowers perfect; plants biennial or perennial, seldom if ever with rhizomes ..... 2
- 2(1). Leaves roughly hispid above, green; stems conspicuously winged decurrent; plants biennial, introduced ..... *C. vulgare*
- Leaves villous, floccose, arachnoid, tomentose, or glabrous, white to gray or green; stems not winged-decurrent, except in some species; plants indigenous biennials or perennials ..... 3



- 3(2). Basal rosettes to 10 dm across, the mature leaves commonly 10–30 cm wide, green, glabrate or glabrous on both sides; heads small, with long, tapering, recurved spines; plants of hanging gardens in southeastern Utah, rarely below them ..... *C. rydbergii*
- Basal rosettes rarely to 5 dm across, the mature leaves usually less than 8 cm wide, floccose, tomentose, arachnoid, or glabrous on one or both sides; plants seldom of hanging gardens in southeastern Utah ..... 4
- 4(3). Bracts, at least the innermost, conspicuously dilated (but not lacerate), or definitely tan to silvery in appearance, contrasting with the overall aspect of the bracts; plants commonly of meadows ..... *C. scariosum*
- Bracts all spinose, or the innermost occasionally twisted to contorted at the tips, but not especially dilated or conspicuously different in color or texture from the overall aspect of bracts (see *C. centaureae*); plants of various habitats ..... 5
- 5(4). Involucral bracts (at least the outer) pinnately spinose; plants green, with yellowish spines, of high elevations in the Wasatch, Tushar, and Uinta mountains ..... *C. eatonii*
- Involucral bracts not, or rarely, pinnately spinose (except in *C. clavatum*, *C. scopulorum*, and *C. ownbeyi*); plants of low to high elevations, but, if pinnately spinose, of other distribution or of low elevations ..... 6
- 6(5). Heads 1.8–2.7 cm high, and about as wide; inner bracts with coarsely lacerate margins; plants of lower middle elevation meadows ..... *C. centaureae*
- Heads 1.5–3 cm high, 1.5–4.5 (6) cm wide; inner bracts not lacerate; leaves thinly textured, finely to coarsely spined, definitely tomentose or glabrous; plants of various distribution ..... 7
- 7(6). Herbage definitely white- to gray-tomentose (or rarely green); involucre 1.5–2 cm high, 1.5–2.5 cm wide; known from white shale outcrops in the Uinta Basin ..... *C. barnebyi*
- Herbage green, or white- to gray-tomentose; involucre mainly longer and broader, but if not, then of different distribution ..... 8
- 8(7). Stems definitely winged-decurrent; heads mainly 1.3–2 cm high, 1.2–3.2 cm wide; herbage white- to gray-tomentose; plants of Sanpete and Washington counties ..... 9
- Stems not winged, or if so, the herbage green and glabrous or nearly so, or the heads commonly larger; plants of various distribution ..... 10
- 9(8). Leaves of upper stem merely spinose-toothed, tapering from base to apex; plants of Washington County only ..... *C. virginensis*
- Leaves of upper stem definitely lobed, the lobes spinose-toothed, with parallel sides from base to near apex; plants not of Washington County ..... *C. subniveum*
- 10(8). Herbage glabrous or glabrate, green ..... 11
- Herbage tomentose, floccose-tomentose, gray or white, or only the upper leaf surfaces green ..... 16
- 11(10). Flowers bright red or carmine; corolla lobes 15–18 mm long; spines of middle involucral bracts 7–11 mm long or more; plants of San Juan County ..... *C. rothrockii*
- Flowers pink, pink-purple, or white; corolla lobes less than 15 mm long; spines of middle involucral bracts 1–6 mm long; plants of various distribution ..... 12

- 12(11). Outer bracts not pinnately spinose; mainly low elevation plants, usually in gypsiferous soils, in the Navajo Basin ..... *C. calcareum*  
 — Outer bracts more or less pinnately spinose; plants of the Navajo and Uinta basins ..... 13
- 13(12). Stems strongly winged almost or quite the length of upper internodes; main upper leaves tripinnatifid; plants of lower elevations in northern Uintah and Daggett counties ..... *C. ownbeyi*  
 — Stems not winged, or rarely some internodes with incipient wings; main upper leaves pinnatifid to bipinnatifid; plants of moderate to high elevations in the southern end of the Uinta Basin and southward ..... 14
- 14(13). Involucral bracts ciliate with long yellowish or brownish multicellular hairs; spines of bracts 6–15 mm long or more; plants of the east Tavaputs Plateau and La Sal Mountains ..... *C. scopulorum*  
 — Involucral bracts more or less ciliate with whitish hairs or a tomentum; spines of bracts mainly 3–7 mm long; plants from the Tavaputs Plateau and south westward ..... 15
- 15(14). Involucral bracts scabrous dorsally, at least the innermost; herbage not at all tomentose; plants of the Henry Mountains ..... *C. calcareum*  
 — Involucral bracts not scabrous dorsally; herbage more or less tomentose; plants not of the Henry Mountains ..... *C. clavatum*
- 16(11). Heads campanulate, mainly 3.5–6.5 cm wide at anthesis, or, if narrower, bracts commonly glandular-thickened dorsally ..... 17  
 — Heads turbinate to subcylindric, mainly 2–3.5 cm wide at anthesis; involucral bracts seldom glandular-thickened dorsally ..... 18
- 17(16). Involucral bracts appearing brown to gray-brown, the spines arising from the body of the bract, not from spreading long-attenuate herbaceous terminal portions; bracts of inflorescence usually prominent; plants of broad distribution ..... *C. undulatum*  
 — Involucral bracts appearing green or fresh green or at least herbaceous, the spines arising from the apex of spreading long-attenuate terminal portions; bracts of inflorescence much reduced; plants of various distribution ..... *C. neomexicanum*
- 18(16). Corollas bright red or carmine; plants from Garfield and Iron counties southward ..... *C. arizonicum*  
 — Corollas pale pink, pink, rose-purple, or white; plants from Garfield and Iron counties northward ..... 19
- 19(18). Involucral bracts (at least the inner) tapering, wedge-shaped, definitely scabrous roughened on dorsal surface, often suffused with red or purple ..... *C. calcareum*  
 — Involucral bracts smooth dorsally, seldom only somewhat scabrous, not conspicuously tapering, and seldom conspicuously suffused with red or purple ..... *C. wheeleri*

*Cirsium arizonicum* (Gray) Petrak Arizona Thistle. [*Cnicus arizonicus* Gray]. Biennial or short-lived perennial herbs from a taproot, the caudex sometimes developed; leaves of basal rosettes 7–36 cm long, bipinnately lobed or parted, the lobes again

lobed or toothed, the main spines 1–6 mm long, white to grayish tomentose below, more or less tomentose and greenish to green above; stems 4–7.5 dm tall, more or less floccose-tomentose; cauline leaves 3–35 cm long, 1–8 cm wide, with lobing and vestiture similar

to the basal, reduced and less deeply lobed upward; involucre 22–30 mm high, 20–50 mm wide, subcylindric to turbinate, the bracts tomentose at margins, and over back, smooth and often shiny medially, rarely glandular-thickened, the apical portions, es-

pecially of the inner definitely scabrous; spines yellowish, 3–10 (15) mm long; corollas crimson to carmine, 25–34 mm long, the tube 8–13 mm long, throat 1.5–11 mm long, the lobes 10–19 mm long. Two more or less distinctive but intergrading phases are present.

1. Heads subcylindric to turbinate; spines 3–10 mm long; plants mainly of the Colorado drainage system (also in western Garfield, and in Iron counties) ..... *C. arizonicum* var. *arizonicum*
- Heads turbinate to broadly so; spines 3–15 mm long or more; plants mainly of the Great Basin and Virgin drainages (also in eastern Iron and western Garfield counties) ..... *C. arizonicum* var. *nidulum*

**Var. *arizonicum*** Salt desert shrub, pinyon-juniper, ponderosa pine, spruce-fir, and hanging garden communities at 1220 to 3050 m in Garfield, Iron, Kane, Piute, San Juan, and Washington counties; Arizona; 26 (iv).

**Var. *nidulum* (Jones)** Welsh comb. nov. [based on: *Cnicus nidulus* Jones Proc. Calif. Acad. II. 5: 705. 1895]. Pinyon-juniper, mountain brush, aspen, ponderosa pine, Douglas fir, white fir, and spruce-fir communities at 1890 to 3200 m in Beaver, Garfield, Iron, Kane, San Juan and Washington counties; Arizona, Nevada; 37 (iii). Relationships apparently lie with *C. rothrockii*, *C. calcareum*, and, to a lesser extent, with *C. wheeleri*.

***Cirsium arvense* (L.) Scop.** Creeping or Canada Thistle. [*Serratula arvensis* L.]. Perennial rhizomatous herbs, the stems mostly 5–10 dm tall, glabrous or sparingly tomentose; leaves 3–15 cm long, 1–6 cm broad, deeply pinnatifid or lobed to merely toothed, glabrous to tomentose above and beneath; heads several to many, mainly unisexual; involucre 10–20 (25) mm high, 10–25 mm wide, the bracts lance-ovate, at least the outer ones and often all of them spine tipped, tomentose to glabrous; corollas pink-purple to white; pappus of pistillate heads longer than the corollas, that of staminate heads shorter than the corollas; achenes 3–5 mm long. Roadsides, fields, and other disturbed sites, but also invading native plant communities, at 1280 to 2535 m, probably in all Utah counties; widespread in North America; adventive from Eurasia; 42 (iii). We have two phases of creeping thistle in Utah; the one with merely toothed (unlobed) leaves is var. *mite* Wimm. & Grab., and the common one

with deeply lobed leaves is var. *horridum* Wimm. & Grab. This common weed and the bull thistle are our only two introduced thistles in the genus *Cirsium*, which makes up a huge assemblage in the Old World. We can expect more introductions.

***Cirsium barnebyi* Welsh & Neese** in Welsh Barneby Thistle. Perennial herbs from a caudex and taproot, the caudex clothed with black marcescent leaf bases; leaves of basal rosettes 11–25 cm long, bipinnately lobed or parted, the lobes again lobed or toothed, the main spines 3–5 mm long, whitish- to grayish tomentose on both sides; stems 3–5 dm tall, whitish tomentose (rarely green); cauline leaves 2–30 cm long, 1–8 cm wide, with lobing and vestiture similar to the basal, reduced and less deeply lobed upwards; involucre 15–22 mm high, 20–30 mm wide, turbinate, the bracts glabrate or sparingly arachnoid on margins, glutinous dorsal ridge inconspicuous, smooth medially, the apical portions of the inner often contorted, not scabrous dorsally; spines 2–7 mm long, flattened apically, more or less spreading; corollas bluish pink. Sagebrush, juniper, cryptantha, ephedra, wildrye, and rabbitbrush communities at 1525 to 2257 m in Uintah County; endemic; 7 (iii). The Barneby thistle is apparently related to the *undulatum* complex.

***Cirsium calcareum* (Jones) Woot. & Standl.** Cainville Thistle. [*Cnicus calcareus* Jones, type from Cainville]. Perennial herbs from a caudex and taproot, the caudex with brownish black to castaneous marcescent leaf bases; leaves of basal rosettes 6–35 cm long, pinnatifid to bipinnatifid, glabrous and green or tomentose on one or both surfaces, the



main spines 3–8 mm long; stems mainly 2–5 dm tall, glabrous or more or less floccose-tomentose, winged-decurrent or not; cauline leaves 3–28 cm long, 0.8–7 cm wide, bipinnatifid, with lobing and vesture like the basal, reduced upward, the main spines 3–8 mm long; involucre 19–34 mm long, 15–45 mm wide, the bracts ovate-lanceolate to linear, more or less tomentose at the margins, smooth and often shiny medially, the dorsal

ridge glandular-thickened or not, the apical portions of at least the inner scabrous; spines straw colored, 1.5–6 mm long; corollas pink to blue-pink. The *calcareum* complex is a portion of the *arizonicum* group of thistles, and has long been misinterpreted. There are three more or less confluent varieties present in Utah. Specimens collected are few, especially in the critical southeastern portion of the state. More work is indicated.

- 1.       Herbage permanently tomentose, the leaves grayish tomentose beneath ..... *C. calcareum* var. *pulchellum*
- Herbage green, the leaves rarely sparingly tomentose along the midveins beneath ..... 2
- 2(1).   Leaves definitely decurrent, the stems winged 2–6 cm below leaf base; plants of San Juan and Wayne counties ..... *C. calcareum* var. *calcareum*
- Leaves not or scarcely decurrent; plants of other distribution ..... *C. calcareum* var. *bipinnatum*

**Var. *bipinnatum* (Eastw.) Welsh stat. nov.** [based on: *Cnicus drummondii* var. *bipinnatum* Eastw. Zoe 4: 8. 1893]. Aspen, Douglas fir, and riparian communities at 1130 to 3150 m in Garfield, Kane, and San Juan counties; Colorado, New Mexico, and Arizona; 8 (i).

**Var. *calcareum* [*Cirsium pulchellum* var. *glabrescens* Petrak type from Elk Mountains, San Juan County].** Riparian communities at 1460 to 2200 m in Carbon, San Juan, and Wayne counties; endemic (?); 4 (i). Jones (Proc. Calif. Acad. II., 5: 704. 1895) cited two collections with the protologue; i.e., Jones 5695bh from Bromide Pass in the Henry Mountains and Jones 5696 from Cainville. His description best fits the Cainville materials, and that collection is here selected as lectotype. The material from Bromide Pass seems best to fit var. *bipinnatum* (q.v.). A peculiar plant with thin leaves that are glabrous on both sides and subentire is known from Cedar Canyon (Atwood and Higgins 5918 BRY). How it fits into the scheme of Utah thistles is not known, but the plant appears to be intermediate between this and some other thistles. The status of the Cainville thistle, as strictly interpreted, beyond Utah is unknown; it seems likely that it does not occur outside the state.

**Var. *pulchellum* (Greene) Welsh comb. nov.** (based on: *Carduus pulchellus* Greene ex Rydb. Fl. Colorado 400, 401. 1906). Rabbit-

brush, sagebrush, tamarix, rabbitbrush, pinyon-juniper, and aspen communities at 1340 to 2745 m in Carbon, Emery, Garfield, Grand, Kane, San Juan, Uintah, Utah, and Wayne counties; Colorado, New Mexico, Arizona; 41 (vii). Both winged and wingless stems are present within our material. There are plants from the San Rafael Swell with winged stems and they are similar to *C. ochrocentrum* Gray of New Mexico, but they appear to be transitional in every way with the wingless plants. And it seems probable that they are not conspecific with that plant as it occurs beyond Utah. Possibly they do warrant taxonomic recognition. Further collections are necessary.

***Cirsium centaureae* (Rydb.) K. Schum. [*Carduus centaureae* Rydb.].** Fringed Thistle. Perennial herbs from a simple caudex and taproot, the caudex with chestnut leaf bases; leaves of basal rosette 2–28 cm long, 1–8 cm wide, pinnatifid, the lobes often again toothed, tomentose below, thinly tomentose to glabrous above, the main spines 1–5 mm long; stems 3–12 dm tall, not succulent, arachnoid or glabrous; cauline leaves with lobing and vesture like the basal, the spines 3–8 mm long; involucre 18–27 mm high, and about as wide, the outer bracts lanceovate, the inner with coarsely lacerate margins, usually dilated in the upper half, tomentose to glabrous on the margins, the dorsal

ridge not well developed, the longest spines 2–5 mm long, straw colored; flowers white to pink or purple. Montane communities at 3355 m in San Juan Co.; Wyoming and Colorado; 2 (0).

***Cirsium clavatum* (Jones) Petrak** Fish Lake Thistle. [*Cnicus clavatus* Jones, type from Fish Lake]. Perennial or biennial herbs from a taproot, and often with a caudex, the caudex clothed with marcescent chestnut-brown leaf bases; leaves of basal rosettes 2.5–22 cm long, bipinnately parted to merely toothed, green on both sides or more or less tomentose below, the main spines 1–6 mm long; stems 3–10 dm tall, glabrous or thinly tomentose; cauline leaves 3–26 cm long, 0.5–7 cm wide, with lobing and vesture like the basal, reduced and less lobed above; involucre 18–23 (32) mm high, 22–30 (55) mm wide, the bracts more or less villous-tomentose on margins, the outer ones usually pinnately spiny, smooth medially, the dorsal ridge not especially glandular, apical portions of the inner ones often scabrous, sometimes slightly dilated-erose; spines yellowish, 3–8 (18) mm long; corollas white or less commonly pink. Sagebrush, meadow, aspen, Douglas fir, and spruce-fir communities at 2135 to 3200 m in Beaver, Carbon, Emery, Garfield, Grand, Kane, Piute, Sanpete, Sevier, Uintah, and Wayne counties; endemic; 27 (viii). The Fish Lake thistle is apparently related to the allopatric *C. eatonii*. It is more or less transitional to *C. wheeleri*, and probably other taxa, especially those with

scabrous inner bracts. Rarely some have decurrent leaf bases, and when the pinnately spinose bracts are poorly developed, this thistle approaches *C. calcareum*. Moore and Frankton (1965) proposed that *C. clavatum* was a hybrid between *C. eatonii* and *C. centaureae*. However, despite its possible origin from hybridization, the taxon seems to be organized on about the same basis as other thistles. Further, its distribution is distinct from that of the putative parents. There does not seem to be justification for recognition of this entity as a hybrid.

***Cirsium eatonii* (Gray) Robins.** Eaton Thistle. [*Carduus eatonii* Gray]. Perennial herbs from a simple or rarely branched caudex and taproot, the caudex clothed with brownish black to brown marcescent leaf bases; leaves of basal rosette 4–20 cm long, more or less bipinnatifid, green and glabrous or nearly so on both sides, the main spines 1.5–4 mm long; stems 1.5–5 dm tall, glabrous or nearly so; cauline leaves 3–25 cm long, 0.6–5.5 cm wide, with lobing like the basal, reduced upward; involucre 20–37 mm high, 25–50 mm wide, the bracts ovate-lanceolate to lance-linear, tomentose to long-villous marginally (rarely overall), the outer ones usually pinnately spiny, smooth to roughened medially, the dorsal ridge not developed, the apical portions of the inner ones sometimes contorted; spines 5–18 mm long, straw colored; corollas pink to white. Three more or less distinctive varieties are present.

1. Involucral bracts copiously gray- to brown-villous with multicellular hairs; corollas ocreoleucous; plants of the Uinta Mountains from Lake Fork eastward ..... *C. eatonii* var. *murdockii*
- Involucral bracts merely white-tomentose or rarely with short multicellular hairs; corollas mainly pink or rose; plants of western Uinta Mountains, and elsewhere ..... 2
- 2(1). Involucral bracts commonly suffused with dark purple; involucre not obscured by outer spinose bracts; plants of the Tushar Mountains ..... *C. eatonii* var. *harrisonii*
- Involucral bracts green or variously purplish; involucre with copious pinnate spines, mainly obscuring the surface of inner bractlets; plants of western Uinta and Wasatch mountains, and Great Basin ranges ..... *C. eatonii* var. *eatonii*

**Var. *eatonii*** [*C. eriocephalum* var. *leiocephalum* D.C. Eaton; this is the basionym for *C. eatonii* in a strict sense, which was renamed by Gray in honor of D.C. Eaton who

collected with Sereno Watson in 1869]. The lectotype came from the head of the Bear River, in Summit County (Watson 691, 1869 US!), with syntypical material being taken

under the same number in Cottonwood Canyon (now Salt Lake County). Lodgepole pine and spruce communities upwards into alpine tundra at 2375 to 3420 m in Duchesne, Juab, Salt Lake, Summit, Tooele, and Weber counties; Nevada and Colorado; 31 (iv). Specimens from the Deep Creek Mountains have few lateral spines on the outer bracts, and approach *C. clavatum* in technical features. More material is needed to determine their status and relationships.

**Var. *harrisonii* Welsh** Talus slopes and alpine meadows at 2975 to 3450 m in Beaver and Piute counties; endemic; 6 (v). This low phase of the Eaton thistle stands geographically apart from the remainder of the species, isolated on the islandlike Tushar Mountains.

**Var. *murdockii* Welsh** The plants grow in talus slopes and on rock stripes at 3230 to 3660 m in Daggett, Duchesne, and Uintah counties; endemic; 7 (iii). This variety has been regarded as constituting a portion of *C. tweedyi* (Rydb.) Petrak. That entity was reviewed by Moore and Frankton (1965) and was mapped to include northeastern Utah in its range. However, no specimens were cited

from Utah. I have seen the type of that taxon, and other material within its range in northwestern Wyoming, and they differ in pubescence of involucre bracts being merely white tomentose along the margins.

***Cirsium neomexicanum* Gray** Biennial herbs from taproots; leaves of basal rosette 5–25 cm long (or more), pinnatifid, the lobes again toothed or lobed, white tomentose below and less so above, the main spines 1–6 mm long; stems 6–15 dm tall, whitish tomentose; cauline leaves 1.5–35 cm long, 0.5–7 cm wide, tomentose, appearing filmy greenish white, lobed like the basal ones, rather abruptly reduced upward, finally minute spiny bracts; involucre 20–30 mm high, 40–65 mm wide, the bracts green or greenish, narrowly lanceolate, tomentose marginally (or overall), the outer ones often reflexed, the inner minutely serrulate-ciliate, long-attenuate apically, the spine a continuation of the attenuation, smooth medially, the glandular dorsal ridge more or less well developed, the apical portions of the inner often contorted; spines 1–9 mm long, yellowish; corollas creamy white.

- 1. Involucre bracts green throughout, the attenuate apex not differing in texture from the body of the bract ..... *C. neomexicanum* var. *neomexicanum*
- Involucre bracts not green throughout, the attenuate apex differing in texture from the body of the bract ..... *C. neomexicanum* var. *utahense*

**Var. *neomexicanum*** Creosote bush, Joshua tree, blackbrush, shadscale, sagebrush, and pinyon-juniper communities at 915 to 2050 m in Beaver, Garfield, Grand, Juab, Kane, Millard, San Juan, Tooele, and Washington counties; Nevada, Arizona, New Mexico; 26 (vii). This is one of the most distinctive species of thistle in Utah. The tall slender stems, with one or few large heads with creamy white flowers, stand in candelabra form in the arid portions of western and southern Utah. Ghostlike stalks of previous years persist for a time, reminding one of the regime which allowed their growth.

**Var. *utahense* (Petrak) Welsh** comb. nov. [based on: *C. utahense* Petrak Beih. Bot. Centr. 35(2): 470. 1917.] Salt desert shrub, sagebrush, pinyon-juniper, and mountain brush communities at 1220 to 2300 m in Cache, Carbon, Emery, Millard, Rich, Salt Lake, Tooele, and Utah counties; Colorado

(?); 24 (ii). This taxon has long been confused with *C. undulatum* with which it shares the grayish tomentum, large heads, and tall stature. They have been separated previously on the basis of glandular development of the dorsal ridge; a feature which is, unfortunately, not diagnostic. The long-attenuate bract apices from which the spines arise are apparently distinctive for this taxon. It is essentially intermediate between *undulatum* and *neomexicanum* in a strict sense. The type is from Silver Reef, Washington County, but the main area of distribution for this variety is apparently along the Wasatch Mountains in northern Utah.

***Cirsium ownbeyi* Welsh** Ownbey Thistle. Perennial herbs from caudex and taproot, the caudex with marcescent dark brown leaf bases; leaves of basal rosettes 5–13 cm long, 1.5–3 cm wide, tripinnatifid, green on both sides, sparingly tomentose along lower side of



midrib; cauline leaves with vesture and lobing like the basal; stems 5–7 dm tall, winged-decurrent, sparingly tomentose; involucre 1.8–2.5 cm high, 1.5–2.5 cm wide, the outermost bracts more or less pinnately spinose, lance-attenuate, smooth medially, the dorsal ridge not well developed, not scabrous, sparingly tomentose along margins, the inner more or less contorted apically; spines 3–8 mm long; corollas rose-pink. Juniper, sagebrush, and riparian communities at 1678 to 1891 m in Daggett and Uintah counties; endemic; 2 (i). Relationships of the Ownbey thistle apparently lie with *C. eatonii*.

***Cirsium rothrockii* (Gray) Petrak** Rothrock Thistle. [*Cnicus rothrockii* Gray; *Cnicus rothrockii* var. *diffusus* Eastw., type from Willow Creek, San Juan County]. Perennial or biennial herbs from a caudex and taproot, the stems 5–8 dm tall, sparingly tomentose or glabrate to glabrous; cauline leaves 3.5–30 cm long, 2–9 cm wide, bipinnatifid, green and glabrous or nearly so on both sides, carried well to the inflorescence; involucre (19) 23–28 (34) mm long, 20–35 mm wide, the bracts lanceolate to lance-linear, more or less tomentose along the margins, smooth medially, the dorsal ridge not or only somewhat glandular, sometimes purplish apically, the apical portions of the inner definitely scabrous, the spines 7–17 mm long; corollas red to carmine. Mixed shrubs and ponderosa pine woods at 1830 to 2560 m in San Juan County; Arizona; 3 (0). This entity is poorly known in Utah; its relationship is with both *C. calcareum* and *C. arizonicum*. It is a green subglabrous plant with red flowers and long involucre spines.

***Cirsium rydbergii* Petrak** Rydberg Thistle. [*Cirsium lactucinum* Rydb., type from Bluff]. Perennial herbs from a definite caudex and taproot, the caudex clothed with blackish brown leaf bases; leaves of basal rosette mainly 30–90 cm long, 15–40 cm wide, bipinnatifid, the lobes narrow to very broad, glabrous to glabrate on both surfaces, the main spines 2–11 mm long; stems 6–12 dm tall or more, glabrous; cauline leaves

glabrous, less lobed and much reduced upwards; involucre 10–17 mm high (not measuring the reflexed outer bracts), 13–26 mm wide, the outer bracts lance-ovate, rather abruptly contracted into recurved spines 3–25 mm long, sparingly tomentose marginally; dorsal glandular ridge lacking, the inner attenuate, not scabrous; flowers pink. Hanging gardens, or rarely in canyons below them, at 1125 to 1525 m in Grand, Kane, San Juan, Wayne (and probably in Garfield) counties; Arizona (?); 15 (v). Both *C. rydbergii* Petrak and *C. lactucinum* Rydberg are based on the same type collection from the hanging gardens near Bluff. The Rydberg thistle is a plant with huge basal rosettes, tall slender flowering stems, and small heads.

***Cirsium scariosum* Nutt.** Meadow Thistle. [*Carduus lacerus* Rydb., type from near Midway; *Carduus olivescens* Rydb., type from the Aquarius Plateau; *Cirsium acaule* var. *americanum* Gray; *Cnicus drummondii* var. *acaulescens* Gray; *C. foliosum* authors, not T. & G.; *C. drummondii* authors, not T. & G.]. Perennial herbs from a simple caudex and taproot, the caudex with chestnut leaf bases; leaves of basal rosette 2–28 cm long, 1–8 cm wide, merely spiny toothed to bipinnatifid, the lobes often again toothed, tomentose to glabrate below, thinly tomentose to glabrous above, the main spines 1–5 mm long; stems lacking, or 1–12 dm tall or more, often succulent and edible, arachnoid to glabrous; cauline leaves (when stems present) bipinnatifid or merely pinnatifid, the spines 3–35 mm long, with vesture like the basal; involucre 22–35 mm high, 20–65 mm wide, the outer bracts lance-ovate, the inner progressively more lance-attenuate, smooth medially, the margins smooth to minutely scabrous, tomentose to glabrous on margins, the dorsal ridge not well developed, the longest spines mainly 2–5 mm long, straw colored, the inner with tips more or less contorted, dilated, or fimbriate, usually whitish or silvery; flowers white to pink or pink-purple. Our specimens fall into two rather distinctive varieties.

- 1. Heads 25–35 mm high, 35–80 mm wide; inner bracts slender, sometimes contorted, not especially dilated; plants mainly 6–12 dm tall ..... *C. scariosum* var. *thorneae*
- Heads 22–30 mm high, 20–40 mm wide; inner bracts often dilated or contorted, sometimes fimbriate; plants 0–6 dm tall ..... *C. scariosum* var. *scariosum*

**Var. *scariosum*** [*Cirsium acaule* var. *americanum* Gray]. This taxon, as here interpreted, consists of an amazingly diverse assemblage that has passed under a series of names including those cited above; and, if it is demonstrated that *C. foliosum* (Hook.) DC. is actually conspecific, that name has priority. Saline seeps and salt marshes, stream sides, terraces, and other meadowlands at 1310 to 3175 m in Carbon, Duchesne, Emery, Garfield, Juab, Millard, Salt Lake, Sanpete, Sevier, Summit, Tooele, and Utah counties; British Columbia to Montana, south to California, Arizona, and Colorado; 43 (x). This phase of *C. scariosum* has passed under the names *C. acaulescens* (Gray) Schum., *C. coloradoense* (Rydb.) Cockerell; *C. tioganum* (Congdon) Petrak, *C. drummondii* T. & G., and *C. foliosum*. Nomenclature is still unclear, and more work is indicated. Our highly variable material is transitional from acaulescent to caulescent within populations, with stems, when present, fleshy and edible. This is our common thistle of meadowlands, and it is unfortunate that nomenclatural entanglements have not allowed selection of an unequivocal name. Reported for the state is *C. parryi* (Harrington, Flora of Colorado, 1952), but I have seen no specimens of that entity from Utah. It would key to *C. scariosum* in the present work. It has densely arachnoid involucre bracts, with at least the innermost dilated-fringed at the tips; flowers are greenish yellow and the leaves are glabrate on both surfaces.

**Var. *thorneae*** Welsh Stream terraces and seeps or springs at 1650 to 2475 m in Beaver, Garfield, Iron, Kane, Millard, and Piute counties; endemic (?); 10 (vi). In addition to the features noted above, the cauline leaves are thick, with coarse veins, and spines 8–35 mm long.

***Cirsium scopulorum*** (Greene) Cockerell in Daniels [*Carduus scopulorum* Greene]. Perennial herbs from taproots; leaves of basal rosettes 3–28 cm long, 0.8–8 cm wide, with spines 2–6 mm long, unlobed to bipinnatifid, tomentose below, glabrate to glabrous and green above; stems mainly 3–7 dm tall, sparingly arachnoid, not winged-decurrent; cauline leaves mainly bipinnatifid, or the upper

ones merely pinnatifid, green above, glabrous to sparingly tomentose below, rather gradually reduced upward; heads in a compact subglobose terminal cluster; involucre 30–35 mm high, 30–55 mm wide, the bracts lance-attenuate, abundantly villous marginally, with long yellowish to brownish multicellular hairs, the outer ones usually pinnately spiny, the dorsal crest not glandular, smooth medially, the apical portions of the inner ones often contorted; spines 10–18 mm long, yellowish; corollas pale yellow to cream. Sagebrush, aspen, and spruce-fir communities at 2135 to 3000 m in Grand, San Juan (?), and Uintah counties; Colorado; 3 (0).

***Cirsium subniveum*** Rydb. Perennial herbs from taproots; basal rosettes not seen; stems mainly 6–10 (13) dm tall, tomentose, winged-decurrent; cauline leaves 3–25 cm long or more, 1–6 cm wide, pinnatifid, tomentose on both sides, or less so above, the bases decurrent; involucre 17–25 mm high, 20–30 mm wide, the bracts ovate-lanceolate, smooth medially, the glandular dorsal ridge more or less developed, none scabrous, tomentose marginally; spines 3–5 mm long; corollas apparently white to cream. Pinyon-juniper community at 1890 m in Rich and Sanpete counties; Oregon to Montana; 2 (0).

***Cirsium undulatum*** (Nutt.) Spreng. Gray Thistle. [*Carduus undulatus* Nutt.]. Perennial herbs from a simple caudex and taproot, the caudex more or less clothed with persistent leaf bases; leaves of basal rosette mainly 7–25 cm long, 1.5–6 cm wide, merely toothed to bipinnatifid, tomentose on both sides, white-tomentose below, white to greenish above, the main spines 1–6 mm long; stems 2–10 (12) dm tall, tomentose; cauline leaves bipinnatifid or the upper ones merely pinnatifid, with vestiture as in the basal ones, rather gradually reduced upward; involucre (15) 20–30 mm high, 20–60 mm wide, the bracts brown or brownish, lance-ovate to lanceolate, tomentose on margins or overall, the dorsal ridge strongly glutinous to undeveloped, the spinose tips spreading, with yellowish spines mainly 2–5 (10) mm long, smooth medially, the apical portion of the innermost more or less contorted; corollas pink, pink-purple, or creamy white.

1. Heads mainly less than 2.5 cm wide, even the largest, commonly (1) 3-10 or more per stem ..... *C. undulatum* var. *tracyi*
- Heads mainly more than 2.5 cm wide, at least the largest, commonly 1-3 per stem ..... *C. undulatum* var. *undulatum*

**Var. *tracyi* (Rydb.) Welsh** comb. nov. [based on: *Carduus tracyi* Rydb. Bull. Torrey Bot. Club. 32: 133. 1905]. Sagebrush, mountain brush, juniper, aspen, and Douglas fir communities at 1525 to 2900 m in Duchesne, Emery, Grand, Juab, Summit, and Uintah counties; Colorado; 26 (iii). This variety grades with the type variety, and separation is at least partially arbitrary.

**Var. *undulatum*** Desert shrub, sagebrush, pinyon-juniper, mountain brush, ponderosa pine, and aspen communities at 1400 to 2600 m in Cache, Carbon, Daggett, Duchesne, Emery, Garfield, Juab, Grand, Rich, San Juan, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, and Weber counties; British Columbia to Minnesota, south to Arizona, New Mexico, and Missouri; 59 (vi).

***Cirsium virginensis* Welsh** Virgin Thistle. Perennial(?) herbs from taproots; leaves of basal rosettes 6-35 cm long, 1-5 cm wide, unlobed, pubescent like the cauline ones, with spines 1-4 mm long; stems 6-15 dm tall, tomentose, winged by definitely decurrent leaf bases; cauline leaves 1.5-15 cm long or more, sinuate-dentate to pinnatifid, whitish tomentose on both sides, or greenish above, often reduced to spiny bracts upwards; involucre 13-20 mm tall, 12-32 mm wide, the bracts ovate-lanceolate to narrowly lanceolate, brownish to straw colored, or often suffused with purple, tomentose marginally (or overall), the outer not especially reflexed, the inner serrulate or entire, smooth medially, the glandular dorsal ridge more or less developed, the apical portions of the inner often contorted; spines 2-6 (8) mm long, yellowish; corollas pink to lavender (or white?). Saline seeps and stream terraces at 850 to 950 m in Washington Co.; Arizona; 9 (i). The small heads and long decurrent leaf bases are diagnostic. The relationships of the Virgin thistle are unknown. It does not appear to be closely related to other species groups represented in our area.

***Cirsium vulgare* (Savi) Ten.** Bull. Thistle. [*Carduus vulgaris* Savi]. Biennial herbs from

taproots; leaves of basal rosette mainly 5-25 cm long, 2-8 cm wide, merely doubly serrate-dentate to doubly pinnatifid, tomentose beneath, coarsely hispid above; stems mainly 3-12 (15) dm tall, spiny-winged by decurrent leaf bases; cauline leaves mainly bipinnatifid, with vestiture as in the basal ones; involucre 28-40 mm high, 35-70 mm wide, the bracts narrowly lanceolate, with spreading spine-tips, tomentose marginally, the dorsal ridge not developed, the inner sometimes contorted apically; spines 1-4 mm long, yellowish; corollas rose-purple. Meadows, fields, roadsides, and other disturbed sites from 1340 to 2745 m in most, if not all, Utah counties; widespread in North America; 52 (i).

***Cirsium wheeleri* (Gray) Petrak** Wheeler Thistle. [*Cnicus wheeleri* Gray]. Perennial or biennial herbs from a simple or branched caudex and taproot, the caudex clothed with persistent brown to dark brown leaf bases; leaves of basal rosettes mainly 7-20 cm long, 1-5 cm wide, once to twice pinnatifid, or merely toothed or spinose-serrate, grayish or whitish tomentose below, thinly so to glabrous and green above, the main spines 0.5-4 mm long; stems 2.5-7 dm tall; cauline leaves 2-25 (32) cm long, 0.5-5 (7) cm wide, with lobing and vestiture similar to the basal, carried well to the inflorescence, though reduced above; involucre 20-27 mm high, 20-35 mm wide, the bracts lance-ovate to lance-linear, more or less tomentose along the margins, smooth medially, the dorsal ridge not or only somewhat glandular, sometimes purplish tipped, the apical portions of at least the inner more or less scabrous; corollas pink to pink-purple, or less commonly white. Mountain brush, pinyon-juniper, white fir, aspen, and spruce-fir communities at (1980) 2165 to 3150 m in Beaver, Emery, Garfield, Iron, Juab, Kane, Millard, San Juan, Sanpete, and Sevier counties; Colorado, New Mexico, and Arizona. Our materials apparently intergrade with *C. undulatum*, *C. nidulum*, and possibly *C. scariosum*. The moderate sized heads, usually pink or pink-purple flowers, low stature, essentially nonglandular



bracts, and usually green upper leaf surface appears to be diagnostic. The phases from Cedar Canyon (Iron County), with merely spinose unlobed leaves, are striking, but probably not more than minor variants; 39 (iv).

CNICUS L.

Annual caulescent spiny herbs from taproots, the juice watery; leaves alternate; heads solitary, terminating branches; involucre bracts in several series, spine tipped, the inner ones pinnately spiny; receptacle densely bristly; corollas all discoid, yellow, perfect; pappus in 2 series, the outer smooth, long, alternating with short sparingly pectinate ones; style with a ring of hairs at base of divergent branches; achenes terete, strongly ribbed, glabrous.

*Cnicus benedictus* L. Blessed Thistle. Plants 1–5 dm tall or more, branching from near the base; stems villous; leaves mainly 8–15 cm long, pinnatifid, more or less glandular and sparingly villous, the spines 0.5–1.5 mm long, the lower ones petiolate, becoming sessile above; involucre 3–4 cm high, closely subtended and obscured by the foliose bracteate upper leaves; corollas yellow. Waste places and gardens at 885 m in Washington County; widespread in the U.S.; adventive from Europe; 1 (0).

CONYZA Less. Nom. Cons.

Annual herbs from taproots, with watery juice; stems erect, commonly branched;

leaves alternate, simple; heads numerous, in cylindric to conic panicles; involucre bracts more or less imbricate, herbaceous medially; receptacle flat or nearly so, naked; rays minute, white or purplish, scarcely surpassing the pappus; disk flowers seldom more than 20, perfect, fertile; pappus of capillary bristles; achenes 1- or 2-nerved or nerveless.

*Conyza canadensis* (L.) Cronq. Horseweed. [*Erigeron canadensis* L.]. Annuals, mainly 0.5–10 dm tall, glabrous or spreading-hairy; leaves 2–8 (10) cm long, 2–8 cm wide, linear to oblanceolate, ciliate-serrate, often deciduous by late anthesis; heads numerous, inconspicuous; involucre 2–3.5 (4) mm high, (2.5) 3–7 mm wide, the bracts lance-subulate, the midvein glandular-thickened, herbaceous medially, glabrous or strigose; rays white or purplish. Weedy species, often in riparian or other moist disturbed sites at 850 to 2135 m in all (?) Utah counties; widespread in North America; Europe; 30 (vi). Our material belongs to var. *glabrata* (Gray) Cronq.

CREPIS L.

Annual, biennial, or perennial caulescent or subcaulescent herbs, from taproots, with milky juice; leaves basal and cauline, alternate, pinnatifid to toothed or entire; heads few to numerous, in corymbose or paniculate clusters; involucre bracts in 1 or 2 series, herbaceous; receptacle naked; corollas all raylike, perfect, yellow or yellowish; pappus of numerous white capillary bristles; achenes terete or nearly so, 10- to 20-ribbed, often beaked.

- 1. Plants annual, adventive, of disturbed sites ..... *C. capillaris*
- Plants perennial, indigenous, neither weedy nor of disturbed sites ..... 2
- 2(1). Leaves and stems glabrous (or glandular-hispid only above); plants subcaulescent or subscapose ..... 3
- Leaves and stems more or less tomentose or puberulent to setose or glandular hispid; plants caulescent ..... 4
- 3(2). Plants less than 10 cm tall, soboliferous, of high elevations ..... *C. nana*
- Plants mainly 15–40 cm tall, never soboliferous, of lower-elevation meadows ..... *C. runcinata*
- 4(2). Heads narrowly cylindric; involucre bracts 5–7 (8), the inner commonly glabrous; flowers mostly 5–10 ..... *C. acuminata*
- Heads narrowly to broadly campanulate; involucre bracts 8–15, tomentose and often setose-hispid; flowers mostly 8–60 ..... 5

- 5(4). Leaf segments linear to narrowly lanceolate, entire or nearly so, the terminal lobe more than 5 cm long; achenes commonly green ..... *C. atrabarba*  
 — Leaf segments narrowly lanceolate to triangular, some usually toothed, the terminal lobe less than 5 cm long; achenes mainly yellowish to brownish ..... 6
- 6(5). Involucres more than twice longer than broad; leaves usually green, runcinate-pinnatifid ..... *C. intermedia*  
 — Involucres less than twice longer than broad, or leaves not green or not runcinate-pinnatifid ..... 7
- 7(6). Involucre and stems not or sparingly setose, but, if setose, the setae gland-tipped ..... *C. occidentalis*  
 — Involucre and/or stems conspicuously setose, the setae not glandular ..... *C. modocensis*

*Crepis acuminata* Nutt. Perennial herbs, 2.5–8.5 dm tall, with 1-several stems from a caudex, the caudex clothed with dark brown marcescent leaf bases; herbage more or less tomentose to glabrate; basal and lowermost cauline leaves 8–33 (40) cm long, 2–12 cm wide, petiolate, the blade elliptic to oblanceolate in outline, pinnatifid to runcinate-pinnatifid, the lobes triangular to narrowly subulate, sometimes toothed or lobed; heads mainly 20–75 or more, cylindric, 5- to 10-flowered; involucres (8) 9–13.5 (16) mm high, 3–7 mm wide, the inner ones 5–8, glabrous or sometimes shortly villous-tomentose, the outer bracts much shorter, commonly tomentose; corollas 10–18 mm long, yellow; achenes yellow to brown, narrowed above. Sagebrush, mountain brush, white fir, aspen, and spruce-fir communities at 1430 to 2900 m in most if not all Utah counties; Washington to Montana, south to California, Arizona, and New Mexico; 69 (viii).

*Crepis atrabarba* Heller [*C. occidentalis* var. *gracilis* D.C. Eaton]. Perennial herbs, 2–4.5 dm tall, with 1-several stems from a caudex, the caudex with dark brown to purplish marcescent leaf bases; herbage gray villous-tomentose to glabrate, basal and lowermost cauline leaves 6–22 cm long, 1.5–4 cm wide, petiolate, the blade lance-elliptic in outline, pinnatifid, the lobes linear or linear-subulate, the terminal lobe 5–9 cm long, entire; heads mainly 2–15, campanulate, commonly 10- to 40-flowered; involucres 9–15 mm long, 7–13 mm wide, the inner ones 8–10, usually grayish tomentulose and often with few glandless black setae; corollas 10–18 mm long, yellow; achenes usually greenish, attenuate at the apex. Sagebrush, ponderosa pine, Douglas fir, and white fir

communities at 1890 to 2870 m in Daggett, Garfield, Salt Lake, Summit, Tooele, Uintah, and Utah counties; British Columbia and Alberta, south to Nevada and Colorado; 8 (i). The species is evidently uncommon in Utah. It is known to form apparent hybrids with *C. acuminata*, and probably with other taxa as well.

*Crepis capillaris* (L.) Wallr. Slender Hawksbeard. Annual or biennial herbs, the stems erect, simple or branched, mostly 1–6 dm tall, sparingly spreading-hairy; basal leaves 3–20 cm long, 0.5–3 cm broad, lanceolate to oblanceolate, denticulate to pinnatifid or bipinnatifid, glabrous or pubescent with stiff spreading hairs, especially along the lower midvein, petiolate; cauline leaves reduced upward, sessile and auriculate-clasping; heads (1) several to numerous, mostly 20- to 60-flowered, borne in an open inflorescence; involucres 5–8 mm high, 5–14 mm wide, the inner bracts lance-attenuate, 8–16, tomentose, often glandular-hairy, glabrous within, the outer bracts lance-linear; achenes 2–5 mm long, pale brown to straw colored; achenes 2–5 mm long, pale brown to straw colored, not beaked. Ruderal weed of Salt Lake County; widely scattered in North America; adventive from Europe; 1 (0).

*Crepis intermedia* Gray Gray Hawksbeard. [*C. barbigera* Leiberg, in part]. Perennial herbs, 2.5–7 dm tall, with 1-several stems from a caudex, the caudex clothed with pale to dark brown marcescent leaf bases; herbage more or less tomentose or villous; basal and lowermost cauline leaves 15–30 cm long, 2–10 cm wide, petiolate, the blade elliptic to oblanceolate in outline, pinnatifid to runcinate-pinnatifid, the lobes triangular to linear-subulate, sometimes toothed or lobed, the

terminal lobe less than 5 cm long; heads mainly 10-60, campanulate, 7- to 16-flowered; involucre 11-20 mm high, 6-12 mm wide, the inner ones 7-12, tomentulose (rarely glabrate), sometimes setose with non-glandular setae, the outer bracts much shorter; corollas 13-20 mm long, yellow; achenes mainly yellowish or brownish, narrowed above. Sagebrush, pinyon-juniper, and mountain brush communities at 1525 to 2575 m in Beaver, Cache, Duchesne, Garfield, Salt Lake, Sevier, Utah, Wasatch, and Washington counties; Washington to Alberta, south to California, Nevada, and Colorado; 16 (iii). The *intermedia* assemblage consists of a series of apomictic intermediates involving *C. acuminata* as one of the parental types, and one or more of the other taxa (i.e., *occidentalis* or *modocensis*) to complete the complex. Included here is the concept of *C. barbigera* as it has been applied in Utah; it consists of a similar hybrid sequence of polyploid apomicts from outside our area.

***Crepis modocensis* Greene** Modoc Hawksbeard. Perennial herbs, 1.5-3.7 dm tall, with 1-several stems from a caudex, the caudex clothed with pale to brown marcescent leaf bases (the stem base often yellow); herbage more or less tomentose; basal and lowermost cauline leaves 9-25 cm long, 2-5 cm wide, petiolate, the blade elliptic to oblanceolate in outline, bipinnatifid, the lobes linear to lance-subulate, again toothed or lobed, the terminal lobe less than 5 cm long; heads 1-9, 10- to 60-flowered; involucre 11-16 mm high, 11-23 mm wide, the inner bracts 10-15, tomentulose, commonly setose, the setae not glandular, the outer bracts much shorter; corollas 13-22 mm long, yellow; achenes greenish black to reddish brown, attenuate. Sagebrush, pinyon-juniper, and mountain brush communities at 1640 to 3175 m in Beaver, Box Elder, Cache, Daggett, Juab, Millard, Rich, Salt Lake, Sanpete, Sevier, Tooele, Uintah, and Utah counties; British

Columbia to California, Nevada, and Colorado; 24 (0). The peculiar numerous slender lateral lobes of the deeply dissected or parted leaf blades are diagnostic.

***Crepis nana* Richards.** Dwarf Hawksbeard. Perennial caespitose herbs, the stems much branched, often soboliferous, mostly 0.2-1.1 dm tall, contracted, usually obscured by the leaves, glabrous; basal leaves mainly 1-7.5 cm long, 0.2-1.8 cm wide, the blades spatulate to orbicular, elliptic, or ovate, glabrous, petiolate; cauline leaves similar to the basal, not clasping; heads few to numerous, mostly 4- to 12-flowered, borne in a compact cushionlike inflorescence; involucre 7-12 mm high, 3-6 mm wide, the inner bracts narrowly oblong, 8-12, greenish or blackish, glabrous, the outer much shorter; achenes brownish, ribbed, shortly beaked. Alpine communities, mainly in talus, at 3050 to 3425 m in Juab, Piute, and Utah or Salt Lake counties; Alaska to Labrador, south to California and Utah; 10 (iii).

***Crepis occidentalis* Nutt.** Western Hawksbeard. Perennial herbs, 1-4 dm tall, with 1-several stems from a caudex, the caudex clothed with brown marcescent leaf bases (the stem base often yellow); herbage tomentose; basal leaves mainly 6-30 cm long, 1-5 cm wide, petiolate, the blade lanceolate to elliptic in outline, pinnatifid to bipinnatifid, the lobes triangular to oblong or linear-subulate, usually again toothed or lobed, the terminal lobe less than 5 cm long; heads 2-25, 12- to 30-flowered; involucre 10-20 mm high, 6-15 mm wide, the inner bracts (7) 8-13 (18), tomentose, the outer ones much shorter; corollas 10-22 mm long, yellow; achenes pale to dark brown, not much attenuate apically. There are three rather weak and arbitrarily recognizable varieties of this species, with some geographical correlation, in Utah. Intermediates occur between the varieties and with other taxa as well.

- 1. Largest heads 12- to 14-flowered, with 8 or 9 involucre bracts; plants mainly of the Great Basin ..... *C. occidentalis* var. *costata*
- Largest heads with more than 15 flowers, with 10-13 involucre bracts; plants of various distribution ..... 2
- 2(1). Involucre with few glandular setae, or none; plants mainly 2-3 dm tall, of the Great Basin ..... *C. occidentalis* var. *pumila*



- 
- Involucres with few to numerous glandular setae; plants mainly 1–2 dm tall, of the Colorado drainage system, less commonly in the southern Great Basin .....
- ..... *C. occidentalis* var. *occidentalis*

Var. *costata* Gray Sagebrush, pinyon-juniper, mountain brush, and aspen communities at 1525 to 2200 m in Box Elder, Juab, Millard, Salt Lake, Tooele (type from Stansbury Island), Utah, and Washington counties; British Columbia to California and Colorado; 23 (0).

Var. *occidentalis* Shadscale, rabbitbrush, sagebrush, pinyon-juniper, and ponderosa pine communities at 1280 to 2565 m in Beaver, Daggett, Duchesne, Garfield, Kane, Piute, Sanpete, Sevier, San Juan, and Washington counties; Oregon to Wyoming, south to California and New Mexico; 25 (v).

Var. *pumila* (Rydb.) Babcock & Stebbins [*Crepis pumila* Rydb.]. Sagebrush, pinyon-juniper, and mountain brush communities at 1700 to 2100 m in Millard and Tooele counties; 7 (0).

*Crepis runcinata* (James) T. & G. [*Hieracium runcinatum* James]. Perennial herbs, 1.5–5 (7) dm tall, with 1–several stems from a caudex, the short caudex clothed with brown marcescent leaf bases; herbage glabrous or hispid above (puberulent in some), not tomentose; basal leaves mainly 2–25 cm long, 1–6 (8) cm wide, petiolate or not, spatulate to oblanceolate, or the blades ovate to oval, oblong, or oblanceolate, more or less pinnatifid to lobed or entire, commonly glaucous; heads 1–30, with 20–50 flowers; involucres campanulate, 8–16 mm high, 6–15 mm wide or more, the inner bracts mainly 10–16, puberulent or hispid, the outer ones much shorter; corollas 9–18 mm long, yellow; achenes light to dark brown, attenuate, or shortly beaked. Three distinctive varieties are present.

1.
- Involucres merely puberulent; plants mainly of saline meadows .....
- ..... *C. runcinata* var. *glauca*
- 
- Involucres hispid with black hairs (resembling species of *Hieracium*); plants of saline or nonsaline sites .....
- ..... 2
- 2(1).
- Basal leaves definitely petiolate, the blade 2–4 times longer than broad .....
- ..... *C. runcinata* var. *hispidulosa*
- 
- Basal leaves broadly winged-petiolate, the blade 4–8 times longer than broad ...
- ..... *C. runcinata* var. *runcinata*

Var. *glauca* (Nutt.) Welsh stat. nov. [based on: *Crepidium glaucum* Nutt., Trans. Amer. Phil. Soc. II. 7: 436. 1841]. Meadows, lake shores, seeps, and hot springs in salt grass, rush, alkali sacaton, and common reed communities at 1220 to 2200 m in Carbon, Daggett, Duchesne, Emery, Grand, Juab, Kane, Millard, Piute, San Juan, Sevier, Tooele, Uintah, Utah, and Wayne counties; Idaho to Saskatchewan, south to Arizona and New Mexico; 34 (xii). This variety has been collected in full flower on 27 April at Monroe Hot Springs.

Var. *hispidulosa* Howell ex Rydb. Sedge-willow and meadow communities at 1370 to 2535 m in Box Elder, Duchesne, Kane, Piute, Rich, Sanpete, Sevier, Summit, and Utah counties; Washington to Montana, south to California and Colorado; 14 (ii). The meadows are seldom saline where this plant occurs.

Var. *runcinata* [*C. runcinata* var. *alpicola* Rydb.]. Bogs in Salt Lake and Utah counties; Manitoba to Minnesota, south to Idaho and New Mexico; 1 (0). This variety is evidently uncommon in Utah.

DICORIA T. & G.

Annual herbs; leaves alternate or the lower ones opposite, simple, entire or toothed; heads unisexual or perfect, discoid; involucre bracts strongly dimorphic, the ca 5 outer ones small, herbaceous, the inner subtending the 1 or 2 pistillate flowers, subscarious, accrescent, much larger than the outer at maturity; chaff narrow, tardily deciduous; pistillate flowers without corolla; staminate flowers with funnelform corolla, the anthers distinct; achenes plano-convex, black, toothed to pectinately wing margined; pappus lacking.

- 1. Foliose bracts of inflorescence orbicular to broadly ovate; plants of Washington County ..... *D. canescens*
- Foliose bracts of inflorescence lance-ovate to lanceolate; plants not of Washington County ..... *D. brandegei*

*Dicoria brandegei* Gray [*D. paniculata* Eastw.; *D. wetherillii* Eastw., a monstrous form]. Plants branched from the base upwards, 1.5–5.5 dm tall, the herbage white-pilose to strigose, the hairs multicellular; lower cauline leaves linear to lanceolate, more or less hastately lobed, toothed, or subentire, 1–7 cm long (including petiole), 0.2–1.5 cm wide; foliose bracts linear to oblong, lanceolate or ovate, rarely if ever orbicular, the blades 0.6–4 cm long; outer involucre bracts oblong, 1.5–3 mm long, the inner ones suborbicular, glandular-puberulent, accrescent in fruit; achenes 5–8 mm long, the winged margin toothed to pectinate, black like the body or pale. In dunes and other sandy sites, in wavy-leaf oak, eriogonum, amsonia, old-man sagebrush, rabbitbrush, ephedra, and vanclevea communities at 1130 to 1830 m in Emery, Garfield, Grand, Kane, San Juan, and Wayne counties; Arizona, New Mexico, and Colorado (?); 21 (v).

*Dicoria canescens* Gray in Torr. Plants branched from base upward, 2.5–9 dm high, the herbage white-pilose to strigose and glandular, the hairs multicellular; lower cauline leaves deltoid-lanceolate, dentate, 1–5 cm long; foliose bracts ovate to orbicular, the blades 0.6–1.5 cm long; outer involucre

bracts oblong, 2–3 mm long, the inner ones suborbicular, glandular-puberulent, accrescent in fruit, to 10 mm long or more; achenes 5–6 mm long, the winged margin toothed to pectinate, black like the body, or pale. Dunes and other sandy sites in blackbrush and creosote bush communities at 825 to 1000 m in Washington County; Arizona, Nevada, and California; 4 (1). Our material belongs to ssp. *clarkae* (Kennedy) Keck.

DYSSODIA Cav.

Annual or perennial herbs or subshrubs from taproots, the juice watery; herbage with conspicuous translucent oil glands; stems striate, numerous; leaves opposite or alternate, entire to pinnatisect; heads solitary at branch ends, or few to several in cymose clusters; involucre bracts in 2 series, distinct or united, and usually with a much shorter outer set; receptacle flat or convex, puberulent; ray flowers yellow, pistillate, fertile; disk flowers fertile; pappus of 10–15 bristle-tipped scales, or these dissected into 3 or more bristles; style branches with a short, conic appendage.

STROTHER J. L. 1969. Systematics of *Dyssodia* Cavanilles (Compositae: Tageteae). Univ. Calif. Publ. Bot. 48: 1–88.

- 1. Plants annual; leaves bipinnatisect; stems villosulous ..... *D. papposa*
- Plants perennial, herbs or subshrubs; leaves simple or merely pinnatisect; stems hispidulous ..... 2
- 2(1). Heads borne on elongate merely bracteate peduncles; leaves pinnately 5-lobed, shortly hispid; pappus scales tipped with usually a solitary bristle ..... *D. pentachaeta*
- Heads sessile or essentially so; leaves simple, entire or rarely irregularly few lobed; glabrous or merely ciliate; pappus scales with 3–5 bristles ..... *D. acerosa*

*Dyssodia acerosa* DC. Dogweed. Plants suffruticose, 10–25 cm tall, forming compact clumps, from taproots; herbage glabrous or villosulous; leaves opposite (or alternate above), simple or irregularly lobed, 3–18 mm long, 0.5–1 (2) mm wide, glandular, ciliate or glabrous; heads sessile or subsessile; involucre turbinate-cylindric, 5–7 mm high, 3–4 mm wide; involucre bracts ca 13, connate, each bract with conspicuous orange

glands; ray flowers 7–8, lemon-yellow; disk flowers 18–25, pale yellow; pappus of ca 20 scales, each dissected into 3–5 bristles; achenes dark brown, 3–3.5 mm long, strigose. Blackbrush communities at 1130 to 1350 m in Garfield, Washington, and San Juan counties; Arizona and New Mexico, south to Mexico; 5 (ii).

*Dyssodia papposa* (Vent.) A.S. Hitchc. [*Tagetes papposa* Vent.]. Plants annual, 1.5–4

dm tall; herbage glabrous to sparingly puberulent; leaves opposite below, alternate above, 1.5–3 (5) cm long, pinnatisect into 11–15 lobes, these sometimes again lobed; heads shortly pedunculate to subsessile; involucre turbinate to campanulate, 6–10 mm high, and about as wide; involucre bracts 6–12, oblanceolate, with yellowish oil glands, connate only at the base; ray flowers 8 or fewer, yellow-orange; disk flowers mainly 20–40, dull yellow; pappus of ca 20 scales, each dissected into 5–10 bristles; achenes black, 8–35 mm long. Sandy roadsides at 1450 to 1500 m in Carbon, Duchesne, Sanpete, and Tooele counties; through much of the United States and Mexico; 4 (0).

*Dyssodia pentachaeta* (DC.) Robins. [*Hymenatherum pentachaetum* DC.] Plants suffruticose, 8–28 cm tall, forming rounded clumps, from taproots; leaves opposite, pinnately parted into 3–5 rigid linear lobes, 0.5–2 cm long, sparingly hirtellous; peduncles 1–8 cm long; involucre turbinate, 4.8–6 mm high, 5–10 mm wide; involucre bracts in 2 series, connate for much of their length, with distinctive yellow oil glands; ray flowers usually 13, bright yellow; disk flowers 50–70, dull yellow; pappus usually of 10

scales, these awnless or with 1–3 awns; achenes brown, 2.2–3 mm long, hispid to glabrous. Blackbrush, ephedra, shadscale, creosote bush, and Joshua tree communities at 700 to 1220 m in Garfield, Kane, San Juan, and Washington counties; Nevada and California to Texas and Mexico; South America; 30 (vi). Our material has been assigned to var. *belinidium* (DC.) Strother [*D. thurberi* (Gray) Woot. & Standl.].

#### ENCELIA Adams

Shrubs; stems ascending to erect, grayish or whitish, the branchlets commonly pubescent; leaves alternate, simple, petiolate, entire or toothed; heads solitary or in cymose clusters, radiate or discoid; involucre bracts in 2 or 3 series; receptacle convex to flat, chaffy, the scales clasping the achenes and falling with them; ray flowers (when present) sterile, yellow; disk flowers perfect, yellow; pappus lacking (or of 2 awns); achenes flat, obovate, villous-ciliate and pubescent on the surfaces.

BLAKE, S. F. 1913. A revision of *Encelia* and some related genera. Proc. Amer. Acad. 49: 358–376.

1. Leaves white-tomentulose; peduncles glabrous; heads in branching cymes; plants rare in Washington County ..... *E. farinosa*
- Leaves strigose to hispid, green; peduncles scabrous to strigose; heads solitary at branch ends; plants of Washington County, and elsewhere ..... *E. frutescens*

*Encelia farinosa* Gray Incienso. Plants mainly 3–10 dm tall, aromatic; leaves clustered at apex of current stems, 2–8 cm long, ovate, entire or toothed, silvery tomentose, petiolate; peduncles elongate, cymosely branched or simple; heads showy, the disk 1–1.5 cm wide; involucre 4–7 mm high, villous and glandular dotted; rays 8–12 mm long, orange-yellow; achenes narrowly obovate. Blackbrush community at 1280 m in Washington County; Nevada, Arizona, and California; Mexico; 1 (0).

*Encelia frutescens* Gray Bush Encelia. [*Simsia frutescens* Gray]. Plants mainly 3–12 (15) dm tall; leaves scattered along current stems, the blades commonly 0.5–2.5 cm long, 0.3–2 dm wide, ovate to orbicular or lanceolate, entire or toothed, strigose to hispid with pustular-based hairs; heads showy or not, the disk 1–3 cm wide; involucre 6–10 mm high, strigose or glandular; rays lacking or 1–16 (or more), 2–12 mm long, yellow; achenes obovate. Two distinctive varieties are present in Utah.

1. Herbage strigose, also with some pustular-based hairs; involucre bracts abruptly caudate-acuminate, strigose; plants of Washington County ..... *E. frutescens* var. *virginensis*
- Herbage hispid with pustular-based hairs; involucre bracts gradually attenuate, more or less glandular (sometimes strigose) ..... *E. frutescens* var. *frutescens*



**Var. *frutescens*** [*E. frutescens* var. *resinosa* Jones in Blake] Talus and slickrock in blackbrush and shadscale communities at 1130 to 1830 m in Emery, Grand, Kane, and San Juan counties; Arizona, California; 15 (vii). There is a cline of glandularity in leaves from definitely glandular in the southern portion of the range in Utah to no glands at all in the northern material. Also, our plants vary from discoid to radiate.

**Var. *virginensis*** (A. Nels.) Blake [*E. virginensis* A. Nels.]. Creosote bush, Joshua tree, and blackbrush communities at 760 to 1325 m in Washington County; Nevada, Arizona, and California; 23 (i).

1. Heads discoid; herbage pilose-hirsutulose; plants arising from a subterranean tuberous root ..... *E. nutans*
- Heads radiate; herbage tomentulose; plants arising from a superficial caudex ..... 2
- 2(1). Petioles broadly winged, mainly shorter than the blades; plants reported from the Virgin Narrows section of Washington County, but none have been seen by me ..... *E. argophyllus* (D. C. Eaton) A. Nels.
- Petioles slender, not or only narrowly winged, mainly longer than the blades; plants commonly in eastern and west central portions of the state ..... *E. nudicaulis*

***Enceliopsis nudicaulis*** (Gray) A. Nels. [*Encelia nudicaulis* Gray]. Scapose, caespitose perennials from a superficial, branching caudex, 10–43 cm tall, the herbage tomentulose, silvery white; petioles 0.7–17 cm long, narrowly if at all winged; leaf blades 2–9 cm long, 1.3–10 cm wide, ovate to elliptic, orbicular or spatulate, cuneate to subcordate basally, obtuse to rounded apically; scapes often with a reduced foliose bract; involucre 1.3–2.2 cm high, 3–5.6 cm wide, the bracts ovate-lanceolate to lanceolate or linear-lanceolate, attenuate to acuminate; rays 13–21, yellow, 22–38 mm long; achenes 10–12 mm long, long silky-pilose, cuneate, black or dark brown; pappus commonly of 2 awns connected by a crown of short connate scales (or none). Commonly on gypsiferous semibarren knolls in blackbrush, rabbitbrush, ephedra, shadscale, grayia, and pinyon-juniper communities in Beaver, Emery, Garfield, Grand, Millard, Piute, San Juan, Sevier, Uintah, and Wayne counties; Idaho, Nevada, Arizona, and California; 66 (xiii).

***Enceliopsis nutans*** (Eastw.) A. Nels. [*Encelia nutans* Eastw.]. Scapose, discoid perennials, 10–25 cm tall, from a subterranean

**ENCELIOPSIS** (Gray) A. Nels.

Perennial scapose or subscapose herbs, from tuberous roots or taproots and subterranean to superficial caudex; herbage pilosulose to velutinous; leaves all basal (rarely some reduced bracteate ones along the scape), the blades spatulate, lanceolate, oblanceolate, ovate, or orbicular; heads solitary; involucre bracts in 2 or 3 series, herbaceous throughout; receptacle flat to convex, chaffy, the scales clasping the achenes; rays yellow, sterile (but apparently pistillate), or lacking; disk flowers numerous, perfect, fertile, yellow; pappus of 2 awns and with or without small scales between, or none; achenes flattened, blackish.

caudex (2–15 cm long) and tuberous root to 4 cm thick, the herbage strigose to pilosulose (antrorsely on the upper surface, retrorsely so below), green; petioles 2–6.5 cm long, often narrowly winged; leaf blades 2–7.5 cm long, 1.4–6 cm wide, ovate to orbicular or spatulate, cuneate basally, obtuse to rounded apically; scapes not bracteate; involucre 0.9–1.5 cm high, 2.5–4 cm wide, the bracts lance-attenuate; rays lacking; achenes 9–11 mm long, oblanceolate, long silky-pilose, brown; pappus lacking. Mainly in finely textured soils in shadscale, budsage, galleta, and ephedra communities at 1310 to 1830 m in Carbon, Duchesne, Emery, Grand, Uintah, and Wayne counties; Colorado (a Colorado Basin endemic); 35 (iii).

#### ERIGERON L.

Annual, biennial, or perennial herbs from caudices, rhizomes, stolons, or taproots, with watery juice; stems decumbent to ascending or erect, rarely prostrate; leaves alternate, simple, entire, toothed, or pinnatifid to palmatifid; heads solitary or few to numerous in corymbose or paniculate inflorescences; in-

volucral bracts equal, or slightly to definitely imbricate, slender, herbaceous (or scarcely herbaceous) throughout; receptacle flat, naked; rays white, pink, purple, bluish, or yellow, numerous, pistillate, or lacking; disk flowers numerous, yellow or tinged reddish; pappus of capillary bristles, sometimes with an outer series of short bristles or scales; style branches with lanceolate and acute or triangular and obtuse appendages; achenes flattened, 2 (rarely 4–14) -nerved. **Note:** This is a large and complex genus. The species, although mainly distinctive, are distinguished by minute features that can be interpreted variously. The genus is a near congener of both *Aster* and *Conyza*, and is not always separable from either.

CRONQUIST, A. C. 1947. Revision of the North American species of *Erigeron* north of Mexico. *Brittonia* 6: 121–302.

- 1. Plants with yellow ray flowers, known from Box Elder County ..... *E. linearis*
- Plants with ray flowers pink, pink-purple, blue, blue-purple, or white, but not yellow, of various distribution ..... 2
- 2(1). Plants annual, biennial, or short-lived perennials from usually slender taproots, lacking rhizomes (except in some specimens of *E. proselyticus*) or woody caudices ..... **KEY I**
- Plants definitely perennial, often from rhizomes or caudices ..... 3
- 3(2). Plants silvery pubescent; achenes with 4 or more nerves; involucral bracts definitely imbricate ..... **KEY II**
- Plants green, or less commonly silvery pubescent; achenes with 2 nerves, or, if with more nerves, involucral bracts subequal ..... 4
- 4(3). Involucres woolly-villous to spreading villous, or villous-hirsute with at least some long spreading multicellular hairs ..... **KEY III**
- Involucres merely glandular, glabrous, puberulent, or with appressed simple or multicellular hairs, rarely with some spreading long hairs near the base ..... **KEY IV**

Key I.

Plants annual, biennial, or short-lived perennials from slender taproots, lacking rhizomes or woody caudices.

- 1. Pistillate corollas very numerous, filiform, the rays short, erect, not exceeding the disk, or the inner ones tubular and lacking rays ..... 2
- Pistillate corollas few to numerous (rarely lacking), the tube generally cylindric, the rays well developed and spreading, rarely reduced or absent ..... 3
- 2(1). Cauline leaves narrowly lanceolate to oblong, or less commonly linear; rayless pistillate flowers present between the ray and disk flowers; inflorescence corymbose, the peduncles curved-ascending, or the heads solitary ..... *E. acris*
- Cauline leaves linear to oblong; rayless pistillate flowers lacking; inflorescence racemose, the peduncles erect or nearly so, or the heads solitary ..... *E. lonchophyllus*
- 3(1). Pappus of ray and disk flowers unlike, that of the disk flowers composed of bristles and short outer setae, that of the ray flowers lacking bristles; plants tall adventive weedy species ..... 4
- Pappus of ray and disk flowers alike, consisting of bristles, sometimes also with outer setae or scales; plants indigenous, low to tall ..... 5
- 4(3). Foliage ample; plants mainly 6–12 (15) dm tall; pubescence of stem long and spreading (at least below); plants introduced, weedy ..... *E. annuus*
- Foliage sparse; plants mainly 3–7 dm tall; pubescence various; plants to be sought in Utah ..... *E. strigosus* Muhl.

- 5(3). Plants diffusely branched, annual; leaves linear to linear-oblong; hairs of stem short and incurved; pappus simple ..... *E. bellidiastrum*  
 — Plants various, but seldom as above, or, if so, the pappus double ..... 6
- 6(5). Disks mainly over 1 cm wide; stems commonly simple, with solitary or few heads, and broad cauline leaves ..... *E. glabellus*  
 — Disks mostly less than 1 cm wide; stems commonly branched, often with several to many heads ..... 7
- 7(6). Stems with hairs all spreading ..... *E. divergens*  
 — Stems with hairs appressed or ascending, or glabrous ..... 8
- 8(7). Leaves entire; plants with sterile flagellate branches ..... *E. flagellaris*  
 — Leaves pinnately lobate or toothed, or if entire then the plants lacking sterile flagellate branches ..... 9
- 9(8). Ray flowers commonly 40–80; plants psammophytes of eastern Washington and western Kane counties ..... *E. religiosus*  
 — Ray flowers commonly 25–40; plants of various substrates in eastern Washington and Kane counties ..... 10
- 10(9). Involucres 2.5 mm high or less; stems 1–11 cm tall; peduncles sparingly villous; plants known from seeps and moist sandstone in Zion National Park .....  
 ..... *E. sionis*  
 — Involucres 2.5–3 mm high; stems 14–25 cm long; peduncles hirsute; plants from limestone and sandstone outcrops in eastern Iron and adjacent Kane counties ..... *E. proselyticus*

### KEY II.

Plants perennial, silvery pubescent; achenes 4 (or more) -nerved;  
 involucre bracts imbricate.

1. Achenes glabrous, with 8–14 nerves; caudex clothed with marcescent leaf bases, the midribs evident in age; plants of higher elevations in southern Utah ..... *E. canus*  
 — Achenes more or less hairy, with 3–8 nerves; caudex lacking marcescent leaf bases, or if these present then the midribs not evident; plants of low to moderate elevations, more widely or otherwise distributed ..... 2
- 2(1). Involucres villous-hirsute with multicellular spreading hairs, the bracts more or less glandular apically; achenes with 3–5 nerves ..... *E. pulcherrimus*  
 — Involucres more or less strigose with simple hairs; achenes 4- to 8-nerved ..... 3
- 3(2). Basal leaves evident, tufted, persistent; heads one per stem; plants through much of Utah ..... *E. argentatus*  
 — Basal leaves mostly withered at anthesis, not forming a conspicuous tuft; plants mainly of southeastern Utah ..... *E. utahensis*

### KEY III.

Plants perennial; achenes mostly 2-nerved; bracts mostly subequal,  
 villous with woolly or spreading multicellular hairs.

1. Plants with pinnatifid or palmatifid or merely lobed leaves, low-spreading, more or less mat or clump forming, of high elevations ..... 2



- Plants with entire leaves, or, if some of them lobed, otherwise differing; low to tall, of various elevations ..... 4
- 2(1). Plants soboliferous, the caudex divided into elongate spreading branches; leaves merely toothed, or if lobed not as below ..... *E. vagus*
- Plants not soboliferous, the caudex branches short; leaves pinnately to palmately lobed or divided ..... 3
- 3(2). Leaves pinnately lobed; plants of the La Sal Mountains ..... *E. mancus*
- Leaves palmately lobed or divided; plants widespread ..... *E. compositus*
- 4(1). Involucres long- and shaggy-villous, the hairs sometimes obscuring the bract surface from middle to base ..... 5
- Involucres hirsute to shortly villous, or, if long and shaggy-villous, the hairs not obscuring the bract surface even in the lower portion ..... 7
- 5(4). Plants 4–7 dm tall or more; known from southeastern Utah ..... *E. elatior*
- Plants mainly 0.3–1 dm tall; distribution various ..... 6
- 6(5). Hairs of involucre with black or dark purple cross-walls; basal leaves rounded to retuse apically; plants of the La Sal mountains ..... *E. melanocephalus*
- Hairs of involucre with pale cross-walls or some with bright reddish purple to dark purple cross-walls; basal leaves acute to abruptly obtuse apically; plants of the Uinta, Deep Creek, Tushar, and La Sal Mountains ..... *E. simplex*
- 7(4). Cauline leaves ample, usually lanceolate or broader; plants tall, erect (more or less asterlike) ..... 8
- Cauline leaves usually much reduced, subulate, linear, oblong oblanceolate, or, if broader, the plants not tall or not erect ..... 11
- 8(7). Hairs of involucre with black cross-walls near their bases; rays white; plants rare, known from the Wasatch Mountains ..... *E. coulteri*
- Hairs of involucre with pale cross-walls; rays white, pink, or purple; abundance and distribution various ..... 9
- 9(8). Plants with cauline leaves well developed and equably distributed, only gradually reduced upward, the middle ones as large as or larger than the lower ones ..... *E. speciosus*
- Plants with cauline leaves rather abruptly reduced upward, those of the middle smaller than the lower ones ..... 10
- 10(9). Involucres glandular or viscid toward the apex; stems curved at base ..... *E. formosissimus*
- Involucres seldom if at all glandular or viscid; stems erect ..... *E. glabellus*
- 11(7). Ray flowers lacking ..... *E. aphanactis*
- Ray flowers present ..... 12
- 12(11). Plants subscapose, the bracteate leaves very small; caudex branches with persistent leaf bases ..... 13
- Plants not subscapose, the leaves merely reduced upward; caudex branches with or without persistent leaf bases ..... 16
- 13(12). Stems and involucres with long, contorted villous hairs; plants of Box Elder and Daggett counties ..... *E. nanus*
- Stems and involucres strigose, pilosulose, or hispidulous, the hairs appressed or ascending to spreading; distribution various ..... 14

14(13).	Leaves linear; herbage strigose; rays 7–11 mm long; plants mainly of lower elevations in the Navajo and Great basins .....	<i>E. compactus</i>
—	Leaves narrowly oblanceolate to spatulate; herbage strigose to pilosulose or hispidulous; rays 4–8.2 mm long; plants of the Uinta Basin and Wasatch Plateau .....	15
15(14).	Involucres long-villous with spreading multicellular hairs; rays 6.8–8.2 mm long; plants of the Wasatch Plateau .....	<i>E. carringtonae</i>
—	Involucres short-hispidulous; rays 4–6.5 mm long; plants of the Uinta Basin .....	<i>E. untermannii</i>
16(12).	Caudex branches robust, 1–2.5 cm thick; plants of western Beaver and Washington counties .....	<i>E. wawahensis</i>
—	Caudex branches mainly less than 1.5 cm thick, or, if broader, of different distribution .....	17
17(16).	Stems spreading-hairy .....	18
—	Stems strigose, or with ascending hairs .....	21
18(17).	Leaves linear to linear-oblanceolate; plants without a prominent caudex, mainly of lower elevations .....	<i>E. pumilus</i>
	Leaves oblanceolate to spatulate; plants with prominent caudex, of low to middle or higher elevations .....	19
19(18).	Stems glandular, with sand grains adhering; plants of lower elevations in Emery and Wayne counties .....	<i>E. maguirei</i>
—	Stems lacking glands; plants of moderate and higher elevations .....	20
20(19).	Stems commonly purplish at the base; leaves thin; plants of broad or other distribution .....	<i>E. eatonii</i>
—	Stems green throughout; leaves thickish; plants of the Uinta and Wasatch mountains .....	<i>E. goodrichii</i>
21(17).	Caudex with spreading subrhizomatous branches, with numerous fibrous roots; stems and lower leaf bases purplish; plants sod forming, of higher elevations ....	<i>E. ursinus</i>
—	Caudex not subrhizomatous, seldom if ever with roots; stem and leaf bases not purple; plants of various elevations .....	22
22(21).	Stems decumbent, sharply bent from apex of caudex .....	23
—	Stems ascending to erect, not sharply bent from caudex apex .....	24
23(22).	Herbage glaucous, sparingly hairy; rays 15–22; basal leaf bases greatly expanded, long-ciliate; plants of eastern Washington County .....	<i>E. canaani</i>
—	Herbage green, not especially glaucous, sparingly to moderately hairy; basal leaf bases not greatly expanded, short-ciliate; plants of broad distribution ....	<i>E. eatonii</i>
24(22).	Cauline leaves moderately well developed, the basal ones linear-oblanceolate; involucres 9–12 mm wide; plants of lower elevations .....	<i>E. engelmannii</i>
—	Cauline leaves much reduced, the basal ones spatulate; involucres less than 8 mm wide .....	25
25(24).	Basal leaves acute or acutish; rays blue to red-purple; pappus subequal to disk corollas; plants widely distributed .....	<i>E. tener</i>
—	Basal leaves obtuse to rounded; rays white to pink; pappus shorter than disk corollas; plants of the Bear River Range, Cache County .....	<i>E. cronquistii</i>

## KEY IV.

Plants perennial, green; achenes mostly 2-nerved;  
involucres mostly lacking; long, spreading multicellular hairs.

1. Plants substoloniferous; leaves spatulate; involucres mainly less than 8 mm wide; plants of hanging gardens in San Juan County ..... *E. kachinensis*
- Plants not substoloniferous; leaves various; involucres mainly over 8 mm wide; plants not or seldom of hanging gardens, variously distributed ..... 2
- 2(1). Cauline leaves ample, usually lanceolate or broader; plants tall and erect (more or less asterlike) ..... 3
- Cauline leaves definitely reduced upward, mostly linear to oblanceolate, or broader in some low species; stems often spreading or decumbent ..... 5
- 3(2). Rays mainly 2–3 mm wide ..... *E. peregrinus*
- Rays 1–2 mm wide ..... 4
- 4(3). Cauline leaves glabrous or minutely glandular, not ciliate, subequal to or shorter than the internodes ..... *E. superbus*
- Cauline leaves ciliate or otherwise pubescent, sometimes also glandular, usually longer than the internodes ..... *E. speciosus*
- 5(2). Pubescence of the stem widely spreading or glandular-scabrous ..... 6
- Pubescence of the stem appressed, ascending, or lacking ..... 8
- 6(5). Involucre canescent with fine white hairs, sometimes also glandular .... *E. caespitosus*
- Involucre glandular and more or less spreading hairy or strigose ..... 7
- 7(6). Stems hirsute with short spreading hairs, conspicuously decumbent; involucres glandular and spreading hairy ..... *E. jonesii*
- Stems glandular-scabrous, ascending or erect; involucres glandular (rarely sparingly strigose) ..... *E. nauseosus*
- 8(5). Basal leaves broadly oblanceolate or usually broader, the blade well-developed, usually abruptly contracted to the petiole ..... 9
- Basal leaves linear to oblanceolate or spatulate, tapering gradually to the petiole ..... 11
- 9(8). Rays purple; achenes 4- to 7-nerved; pappus simple ..... *E. peregrinus*
- Rays various; achenes 2-nerved (occasionally more, but rays then pale and pappus double) ..... 10
- 10(9). Stems essentially scapose, the upper bracts linear; plants known from the Wasatch Mountains ..... *E. garrettii*
- Stems subscapose, the upper bracts oblong; plants rather broadly distributed ....  
..... *E. leiomeris*
- 11(8). Peduncles and involucres densely glandular, not hairy; stems glabrous or essentially so; plants of the Wasatch Mountains ..... *E. arenarioides*
- Peduncles not glandular, or, if so, the stem more or less hairy; involucres and distribution various ..... 12
- 12(11). Bases of basal leaves neither enlarged nor of different texture than the blades; blades linear or linear-filiform; plants known from Cache and Daggett counties ..... *E. filifolius*



- Bases of basal leaves somewhat enlarged, membranous or thickened, or otherwise different from above; blades not linear ..... 13
- 13(12). Leaves glabrous or nearly so, the hairs, if present, short and appressed .... *E. leiomeris*
- Leaves hairy, the hairs spreading or curved-ascending ..... 14
- 14(13). Plants subscapose; cauline leaves reduced to acicular bracts; plants of the Uinta Basin and west Tavaputs Plateau ..... *E. nematophyllus*
- Plants caulescent; cauline leaves well developed ..... 15
- 15(14). Stems decumbent-ascending, commonly curved at the base; basal leaves sheathing basally; heads mainly solitary ..... *E. abajoensis*
- Stems erect or nearly so; basal leaves not especially sheathing; heads mainly 2-4 ..... *E. awapensis*

***Erigeron abajoensis* Cronq.** Abajo Daisy. Perennial herb, with a taproot and stout caudex, the caudex branches clothed with brown marcescent leaf bases; stems decumbent to spreading at the base, 5-20 cm long, strigose to strigulose, the hairs ascending; basal leaves oblanceolate, 2-7 cm long, 2-6 mm wide, more or less sheathing basally; cauline leaves several to many, oblong to lance-oblong, mostly 0.6-2.5 cm long, 1.5-4 mm wide; heads solitary, less commonly 2-4; involucre 4-5.2 mm high, 7-12 mm wide, the bracts subequal or slightly imbricate, somewhat thickened dorsally, greenish brown, strigose to strigulose, the hairs multicellular; rays about 40-60, pink-purple to blue (or white), 3-8 mm long, 1-1.8 mm wide; pappus double, the inner of 12-20 bristles, the outer of setae or scales; achenes 2-nerved, hairy. Pinyon-juniper, ponderosa pine, and spruce-fir communities at 2135 to 3450 m in Garfield, Piute, San Juan, and Wayne counties; endemic; 4 (i).

***Erigeron acris* L.** Bitter Fleabane. Short-lived perennial, with a slender taproot and poorly developed caudex; stems erect or decumbent at the base, 8-32 cm tall, spreading-hairy and more or less glandular; basal leaves spatulate-oblanceolate, 0.5-6.5 cm long, 2-10 mm wide, entire or sparingly toothed; cauline leaves several to many, oblong to narrowly oblanceolate, lanceolate, or linear, mostly 0.8-7 cm long, 1-8 mm wide; heads solitary, or more commonly few to numerous, on short to elongate peduncles; involucre 4.5-8 mm high, 9-17 mm wide, the bracts imbricate, not especially thickened, green or tinged pink apically in some, sparingly hairy

with spreading to ascending stiff multicellular hairs and beset with short glandular processes; rays numerous, pink or white, erect, about 2-4.5 mm long, the inner pistillate flowers eligulate, with corolla tubular; pappus of ca 25-35 slender barbellate white to reddish bristles, surpassing the disk corollas; achenes 2-nerved, sparingly hairy. Lodgepole pine, spruce, and fir communities at 2800 to 3500 m in Duchesne, Summit, and Uintah counties; Alaska to Labrador, south to California, Colorado, Michigan, and Maine; circumboreal; 11 (ix). Varietal status of our few specimens is unclear. One of the specimens has few heads and has essentially eglandular bracts, one is monocephalus and has glandular involucre, and the others are polycephalus and have glandular involucre. Names available are var. *asteroides* (Andrz.) DC. and var. *debilis* Gray, but there appear to be three rather poorly differentiated taxa involved. Decisions as to proper names must await further study.

***Erigeron annuus* (L.) Pers.** Annual Fleabane. Plants annual, with slender taproots; stems erect, 6-12 (15) dm tall, sparingly to densely hirsute with long spreading hairs, becoming appressed upward; basal leaves commonly withered at anthesis, ovate to suborbicular, petiolate; cauline leaves numerous, lanceolate to oblong, mainly 1.5-8 cm long, 3-20 mm wide, serrate to entire; heads several to numerous, in a leafy inflorescence; involucre 7.5-12 mm wide, 3-5 mm high, the bracts subequal or the outer somewhat shorter, greenish to brownish, acuminate-attenuate, glandular and sparingly villous-hirsute with multicellular hairs; rays ca 80-125,

white (rarely bluish), 4–10 mm long, 0.5–1 mm wide; pappus double; achenes 2-nerved, hairy. Roadsides, fields, and other disturbed sites at 1370 to 1830 m in Utah and Wasatch counties; widespread in the United States; Europe; 8 (ii).

***Erigeron aphanactis* (Gray) Greene** **Hairy Daisy.** [*E. concinnus* var. *aphanactis* Gray]. Perennials with definite branching caudex; stems decumbent to ascending or erect, 5–20 (30) cm tall, sparingly to copiously spreading-hirsute with multicellular hairs; basal leaves narrowly oblanceolate to spatulate, 0.5–8 cm

long, 1–6 mm wide, petiolate; cauline leaves well developed or essentially lacking; heads solitary or several; involucre 7–15 mm wide, 3.5–6 mm high, finely to coarsely spreading-hirsute and sometimes also finely glandular; bracts subequal or somewhat imbricate, slender, acuminate, green or greenish brown, the midrib thickened; pistillate flowers present, tubular, eligulate, or sometimes with rays shorter than the disk; pappus double; achenes 2-nerved, sparsely hairy. This species is represented in Utah by two rather weak varieties.

1. Plants essentially scapose; corolla lobes sometimes becoming reddish or purplish ..... *E. aphanactis* var. *congestus*
- Plants with leafy stems; corolla lobes commonly yellowish .....  
..... *E. aphanactis* var. *aphanactis*

**Var. *aphanactis*** Salt desert shrub, sagebrush, pinyon-juniper, sagebrush, and mountain brush communities at 1300 to 2700 m in Beaver, Garfield, Juab, Piute, Sanpete, Sevier, Washington, and Wayne counties; Oregon and Idaho south to California, Arizona, and Colorado; 21 (iii).

**Var. *congestus* (Greene) Cronq.** [*E. congestus* Greene]. Juniper-black sagebrush, sagebrush, and aspen communities at 1830 to 2600 m in Garfield and Sevier counties; California; 3 (0).

***Erigeron arenarioides* (D.C. Eaton) Gray** [*E. stenophyllus* D.C. Eaton, not H. & A.; *Aster arenarioides* D.C. Eaton ex Gray]. Perennial herbs, with definite branching caudex, the caudex branches clothed with brownish marcescent leaf bases; stems ascending to erect, 6–25 (30) cm tall, slender, glabrous or glandular below the heads; leaves glabrous or sparingly strigose, the basal ones linear-filiform to linear-oblanceolate, 1.5–6 (8) cm long, 0.5–2 (4) mm wide, entire; heads solitary or 2 or 3 (rarely more); involucre 7–9 mm wide, 3.7–5 mm high, the bracts imbricate in several series, greenish brown, finely glandular, the tips often purplish; rays 10–25, blue, 4–8 mm long, 0.8–1.8 mm wide; pappus of about 10–16 bristles, and with a few short setae; achenes 2-nerved, sparsely strigose. Crevices in limestone and quartzite outcrops, rarely in beach sand, at 1300 to 2440 m in Salt Lake, Tooele, Utah, and Weber counties; endemic; 8 (0).

***Erigeron rgentatus* Gray** **Silver Daisy.** [*Wyomingia argentata* (Gray) A. Nels.]. Perennial herbs, with definite branching caudex, the caudex branches more or less clothed with brown marcescent leaf bases, the midribs not especially persistent; stems erect, 9–28 (40) cm tall, finely strigose and silvery to gray-green; basal leaves tufted, spatulate to oblanceolate, 1.5–7 cm long, 1–4 (6) mm wide, petiolate, entire; cauline leaves reduced upward; heads solitary; involucre 10–18 mm wide, 5.5–9 mm high, the bracts strongly imbricate, silvery strigose with appressed antrorse hairs; rays ca 20–50, blue, lavender, or pink to white, 9–15 mm long, 1.6–2.8 mm wide; pappus double; achenes pilose. Salt desert shrub, sagebrush, pinyon-juniper, and mountain brush communities at 1600 to 2440 m in Beaver, Box Elder, Emery, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, Tooele, and Utah counties; Nevada, California; 29 (iii).

***Erigeron awapensis* Welsh** **Awapa Daisy.** Perennial herbs from a branching caudex, the caudex branches clothed with ragged brown marcescent leaf bases; stems erect or nearly so, 10–24 cm long, strigose, the hairs ascending; basal leaves 1.5–7 cm long, 2–8 mm wide, not especially sheathing; cauline leaves well developed, oblong to linear, mostly 1–4 cm long, 2–4 mm wide; heads 2–4, rarely solitary; involucre 3–9 mm wide, 3.7–4.5 mm high, the bracts more or less imbricate, thickened near the base dorsally, greenish,

strigulose, the hairs multicellular; rays 35–45, pink-purple to pink (or white?), 5–6 mm long, 0.9–1.8 mm wide; pappus apparently simple, of 15–20 slender bristles, and with a few inconspicuous shorter setae in some; achenes 2-nerved, hairy. Pinyon-juniper and sagebrush communities at 2135 to 2260 m in Garfield and Wayne counties; endemic; 2 (1).

*Erigeron bellidiastrum* Nutt. Plants annual (or biennial), the stems 3.5–32 (50) cm tall, erect or ascending, often intricately branched; herbage strigulose with incurved multicellular hairs; leaves mainly cauline, 0.5–4 cm long, 1–3 (6) mm wide, linear to oblanceolate, entire (or sparingly toothed to pinnatifid), petiolate, becoming sessile upward; heads solitary to numerous; involucre 5–11 mm wide, 3–5 mm high, the bracts hirtellous with spreading curved multicellular hairs, thick, greenish, subequal, or the outermost shorter; rays ca 30–70, pink or white, 4–6 mm long, ca 1 mm wide; pappus of ca 15 deciduous bristles; achenes 2-nerved, hairy. Vanclevea-ephedra, blackbrush, and pinyon-juniper communities at 1125 to 1830 m in Garfield, Grand, Kane, San Juan, and Washington counties; Wyoming and South Dakota to New Mexico and Texas; 23 (ii).

*Erigeron caespitosus* Nutt. Tufted Daisy. [*E. caespitosus* var. *laccoliticus* Jones]. Perennial herbs with a branching caudex, the caudex branches clothed with brown or blackish marcescent leaf bases; stems decumbent at the base, 4–25 (30) cm tall, hirtellous with short spreading hairs (especially above); basal leaves oblanceolate to spatulate, generally rounded to obtuse apically, 1–9 cm long, 2–13 mm wide, 1- to 3-nerved; cauline leaves reduced upward; heads solitary or few to several; involucre 9–18 mm wide, 4–7 mm high, the bracts subequal to imbricate, thickened on the back, green, strigose to pilose with multicellular hairs spreading laterally from the midrib; rays ca 30–100, blue, pink, or white, 5–15 mm long, 1–2 mm wide; pappus double; achenes 2-nerved, hairy. Sagebrush, pinyon-juniper, aspen, lodgepole pine, spruce, and tundra communities at 2135 to 3570 m in Daggett, Duchesne, Emery, Garfield, Salt Lake, Sevier, Summit, Uintah, Utah, Wasatch, and Wayne counties; Alaska and Yukon south to Arizona, New Mexico,

and Nebraska; 40 (viii). This is a variable species with many phases in Utah, each differing in stature, nature of vesture, size of heads, and other features that fail singly and in combination as diagnostic criteria. The species interfaces with *E. nauseosus*, *E. abajensis*, and probably with other taxa.

*Erigeron canaani* Welsh Canaan Daisy. Perennial herbs from a simple (or branched?) caudex, this clothed with brown marcescent leaf bases, the taproot prominent; stems 7–20 cm tall, decumbent to ascending, sometimes purplish at the base, sparingly pubescent with ascending hairs; leaves pubescent like the stem, the basal ones tufted, 1-nerved, 1.4–9 cm long, 0.7–1 mm wide, linear, involute, sharply acute, conspicuously expanded and long-ciliate basally; cauline leaves numerous, reduced upward; heads 1–3; involucre 9–13 mm wide, 5.3–6.5 mm high; bracts imbricate, conspicuously glandular and sparingly to moderately villous-pilose with multicellular hairs, green or variously suffused with purple; rays 15–22, white or pinkish, 3.5–5 mm long, 1.8–2.1 mm wide; pappus single, of ca 20 slender bristles; achenes 2-nerved, hairy. Ponderosa pine community at 1585 to 2075 m in Washington County; endemic; 2 (i). The Canaan daisy is similar in general aspect to *E. eatonii* (q.v.). The involute linear glaucous leaves and few ray flowers appear to be diagnostic.

*Erigeron canus* Gray Hoary Daisy. Perennial herbs, with branching caudex, the caudex branches clothed with persistent leaf bases, the marcescent midribs prominent; stems erect or nearly so, 5–30 (35) cm tall, appressed strigose; basal leaves oblanceolate, mostly 1–6 cm long and 1–5 (7) mm wide, hairy like the stems; cauline leaves reduced upward; heads solitary (rarely up to 4); involucre 9–16 mm wide, 5–7 mm high, the bracts strigulose with ascending to spreading multicellular hairs and more or less glandular, imbricate; rays ca 30–40, blue or white, 7–12 mm long, 0.8–1.4 mm wide; pappus double; achenes ca 8- to 14-nerved. Gravelly substrates of the Cedar Breaks (Wasatch) Formation in ponderosa pine and sagebrush communities at 2300 to 2500 m in Garfield County; Wyoming and South Dakota to Arizona and New Mexico; 3 (i).



*Erigeron carringtonae* Welsh Carrington Daisy. Pulvinate perennial herbs with a pluricipital caudex, the branches clothed with conspicuous brown to straw colored or ashy marcescent leaf bases; leaves mainly basal, thickish, 0.6–3.5 cm long, 1–5 mm wide, spatulate to oblanceolate, strigose to pilosulose, obtuse to rounded apically; scapes 2.5–8 cm tall; heads solitary; involucre 9.8–15 mm wide, 5.8–7 mm high, the bracts imbricate, suffused with purple or green, the inner greenish with scarious margins, spreading-vil-lous with long multicellular hairs; rays 18–30, pink to pink-purple, 6.8–8.2 mm long, 1.4–2.3 mm wide; pappus double, the inner of 25–35 barbellate bristles, the outer of short setae; achenes 2-nerved, pilose. Meadows and

escarpment margins, commonly on Flagstaff Limestone at 3050 to 3355 m in Emery and Sanpete counties; endemic; 6 (i).  
*Erigeron compactus* Blake [*E. pulvinatus* Rydb.]. Perennial pulvinate herbs with a branching caudex, the caudex branches clothed with marcescent leaf bases; leaves mainly basal, 4–20 mm long, 0.6–1.4 mm wide, linear, finely strigose; scapes 2–10 cm tall; heads solitary; involucre 7–17 mm wide, 5–8.5 mm high, the bracts more or less imbricate, straw colored or greenish brown to green, hispidulous with short spreading hairs; rays mainly 15–50, white or pink, 7–11 mm long, 1.4–2.5 mm wide; pappus double; achenes 2-nerved. Two geographically segre-gated races are recognizable as varieties.

1. Leaves yellowish green; involucrel bracts appressed strigose; plants of the Great Basin ..... *E. compactus* var. *compactus*
- Leaves grayish green; involucrel bracts spreading-hispidulose; plants of the Colorado Drainage system ..... *E. compactus* var. *consimilis*

**Var. *compactus*** Pinyon-juniper community at 1830 to 2135 m in Beaver, Box Elder, Mil-lard, and Tooele counties; Nevada and Cali-fornia; 4 (0).  
**Var. *consimilis*** (Cronq.) Blake Salt desert shrub and pinyon-juniper communities in Daggett, Duchesne, Emery, and Wayne counties; Arizona; 11 (i). The general aspect of this variety is similar to that of *E. pulcher-rimus* (q.v.), with which it is sympatric in much of its range; the 2-nerved achenes and low subscapose stems are diagnostic.  
*Erigeron compositus* Pursh Fern-leaf Daisy. Perennial caespitose cushion plants, with a shortened pluricipital caudex, the cau-dex branches densely clothed with brown marcescent leaf bases; herbage glandular and more or less spreading-hairy; leaves mainly basal, mostly 2- or 3-ternately lobed or dis-sected, 0.5–7 cm long; cauline leaves few and reduced upward, simple or ternate; stems subscapose, 2–20 (25) cm tall; heads solitary; involucre 8–20 mm wide, 5–10 mm high, the bracts glandular and spreading-hairy, com-monly purplish at the tips; rays lacking, or developed and 20–60, blue, pink, or white, to 12 mm long and 2 mm wide; pappus simple; achenes 2-nerved, villous-hirsute. Sagebrush, rabbitbrush, aspen, aspen-fir, lodgepole pine, spruce-fir, and alpine tundra communities at

2375 to 3965 m in Beaver, Box Elder, Dag-gett, Duchesne, Emery, Garfield, Iron, Juab, Millard, Piute, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, Wayne, and Weber counties; Alaska to Greenland, south to California, Arizona, Col-orado, South Dakota, and Quebec; 77 (xvi). This is an extremely variable apomictic spe-cies, with rare sexual individuals. Our mate-rial has been assigned to var. *glabratus* Ma-coun, which is separable from the type variety only problematically.  
***Erigeron coulteri*** T.C. Porter in Port. & Coult. Coulter Daisy. Perennial herbs from a rhizome or caudex; stems more or less spreading-hairy, mainly 1–6 dm tall; basal and cauline leaves ample or the cauline ones somewhat reduced, entire or toothed, the largest 6–15 cm long, 1–2.5 cm wide, oblan-ceolate to elliptic, lanceolate, oblong, or ovate; heads solitary or 2 or 3; involucre 10–15 mm wide, 6–10 mm high, the bracts densely white hirsute below with hairs hav-ing purplish black cross-walls, at least near the base, glandular to the tips; rays 40–80, ca 10–15 mm long, white to pink-purple; pap-pus simple; achenes sparsely hairy. Moist slopes in Salt Lake and Utah counties; Ore-gon to Wyoming, south to California, Ne-vada, and New Mexico; 8 (0).

*Erigeron cronquistii* Maguire Cronquist Daisy. Perennial herb, with short caudex branches clothed with brown leaf bases; stems 1.5–7 cm long, sparingly strigose; basal leaves 0.5–4 cm long, spatulate to oblanceolate or elliptic, petiolate, sparingly strigose; cauline leaves few or wanting; heads solitary, sometimes 2; involucre 5–8 mm wide, 3–5 mm high, glandular and spreading-hirsute, the bracts imbricate, green, often suffused with purple; rays 10–25, white or pale pink, 5–6 mm long, 1.3–2.1 mm wide; pappus single, or with a few shorter outer ones; achenes 2-nerved, sparingly hairy. Limestone cliffs at 1750 to 2600 m in the Bear River Range, Cache County; endemic; 2 (0). This beautiful, tiny plant is a near congener of *E. tener* (q.v.).

*Erigeron divergens* T. & G. Spreading Daisy. [*E. divaricatus* Nutt., not Michx.]. Annual, biennial, or short-lived perennial herbs from taproots; stems branched from the base and above, pubescent with spreading hairs, 0.5–5 (7) dm tall; basal leaves oblanceolate to spatulate, mainly 1–7 cm long, 2–10 mm wide, spreading-hairy, petiolate, usually lacking at anthesis; cauline leaves reduced upward; heads several to numerous; involucre 7–11 mm wide, 4–5 mm high, finely glandular and hirsute with long, spreading hairs, the bracts green, attenuate; rays ca 75–150, blue, pink, or white, ca 5–10 mm long, 0.5–1.2 mm wide, sometimes scarcely developed; pappus double; achenes 2 (4) -nerved, sparsely hairy. Riparian, rabbitbrush, sagebrush, pinyon-juniper, mountain brush, ponderosa pine, and aspen-spruce communities at 975 to 2900 m in Beaver, Cache, Daggett, Davis, Duchesne, Emery, Garfield, Grand, Iron, Kane, Millard, Piute, Salt Lake, San Juan, Sevier, Tooele, Uintah, Utah, Wasatch, Washington, and Weber counties; British Columbia to South Dakota, south to California, Arizona, and Mexico; 109 (xiii). Our materials have been segregated into two weak varieties differentiated as follows: var. *cinereus* Gray, with earliest flowers borne on long naked peduncles and plants later with long leafy stolons; and var. *divergens*, with earliest heads on leafy peduncles and plants not developing leafy stolons. The var. *cinereus* is evidently rare in Utah; 5 (ii).

*Erigeron eatonii* Gray Eaton Daisy. [*E. eatonii* f. *molestus* Cronq., type from the Stansbury Mountains]. Perennial herbs, from a short simple or branched caudex, this clothed with brown marcescent leaf bases, the taproot prominent; stems 5–38 cm tall, decumbent to ascending, usually purplish at the base, strigose or rarely more or less hirsute; leaves pubescent like the stem, the basal ones tufted, 1- (or more commonly) 3-nerved, acute, mainly 1.2–12 (15) cm long, 1–10 mm wide; cauline leaves numerous, reduced upward; heads 1–3 (7); involucre 8–15 mm wide, 5–8 mm high, the bracts imbricate, conspicuously glandular and more or less hirsute with spreading-ascending multicellular hairs, green or the tips purplish; rays about 20–50, white to blue or pink, mainly 4–10 mm long, 1–2.5 mm wide; pappus single or with a few short outer setae; achenes 2 (3) -nerved. Sagebrush, mountain brush, pinyon-juniper, ponderosa pine, aspen, spruce-fir, and alpine tundra communities at 1890 to 3630 m in all Utah counties except for Box Elder and Morgan; Oregon to Wyoming, south to California, Arizona, and Colorado; 171 (xxv). This is a widespread and variable species, with variants differing in size, in head dimensions, and in nature of the pubescence. The hirsute phase from the Stansbury Mountains has been designated as f. *molestus* Cronq.

*Erigeron elatior* (Gray) Greene Tall Daisy. [*E. grandiflorus* var. *elatior* Gray]. Perennial herbs, from a short caudex (seldom collected); stems mainly 4–7 dm tall, often purplish below, leafy throughout, spreading-hairy and more or less glandular above; leaves mainly 2.2–10 cm long, 6–28 mm wide, the lowermost smaller than the middle ones and commonly withered at anthesis, ovate-lanceolate to lanceolate, entire, the lower petiolate, becoming sessile and somewhat clasping upward; heads 1–3 (6); involucre 12–20 mm wide, 7–11 mm high, the bracts densely woolly-villous with long, flattened, shiny, multicellular hairs, some of which may have reddish purple cross-walls, subequal, long-attenuate apically, the tips glandular, purple, and reflexed; rays ca 75–150, pink or pink-purple (white), 12–20 mm long, 0.8–1.6 mm wide; pappus double; achenes 2-nerved, hairy. Meadows and openings in mountain

brush and spruce-fir communities at 2440 to 3050 m in the La Sal Mountains of Grand and San Juan counties; Colorado and Wyoming. This is a beautiful asterlike plant with equably leafy stems and densely villous involucre; 4 (0).

*Erigeron engelmannii* A. Nels. Engelmann Daisy. Perennial herbs, with short branching caudex, this clothed with straw-colored to brown marcescent leaf bases; taproot definite; stems 3–24 (30) cm tall, decumbent to erect, strigose or the hairs ascending, multicellular; basal leaves 1–6 (10) cm long, 1.5–5 mm wide, linear-ob lanceolate, the blades hairy like the stems, the basal margins long and coarsely ciliate; cauline leaves reduced but well distributed upward; heads 1–4; involucre 7–12 mm wide, 4–7 mm high, the bracts hirsute and more or less glandular, subequal, green, with brownish midrib and scarious apices; rays ca 35–100, white (rarely pink or blue), 5–12 mm long, 0.6–2 mm wide; pappus double; achenes 2-nerved, hairy. Salt desert shrub, sagebrush, rabbitbrush, and pinyon-juniper communities at 1370 to 2200 m in Box Elder, Cache, Daggett, Duchesne, Grand, Juab, Millard, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, and Utah counties; Oregon to Wyoming and Colorado; 28 (iii).

*Erigeron filifolius* Nutt. Thread-leaf Daisy. Perennial herbs, with branching woody caudex, the caudex branches clothed with brownish marcescent leaf bases; stems 10–30 (50) cm tall, more or less strigose; leaves 1–8 cm long, 0.3–3 mm wide, linear or filiform, strigose, the cauline ones distributed along the stem but smaller than the basal ones; heads 1-several; involucre 5–15 mm wide, 4–6 mm high, the bracts villous to strigose and commonly glandular as well, subequal or somewhat imbricate, greenish; rays ca 15–75, blue to pink or white, 3–12 mm long, 1–2 mm wide; pappus single or with a few outer setae; achenes 2-nerved, more or less hairy. The species is reported from Utah (Cache County, Logan, C. P. Smith 1737 RM) by Cronquist (1947), also Daggett County; British Columbia and Montana to California and Nevada; 1 (0).

*Erigeron flagellaris* Gray Trailing Daisy. Biennial or short-lived perennials, with a

poorly developed caudex (if at all) and slender taproot; herbage strigose or with spreading hairs at stem base; stems 3–25 (40) cm tall, the fertile ones terminated by a solitary head, the sterile ones developed as leafy stolons; basal leaves 1–5 cm long, 1.5–8 mm wide, oblanceolate to spatulate; cauline leaves smaller upward, linear to oblanceolate; heads solitary; involucre 7–13 mm wide, 3.5–5 mm high, the bracts with appressed or spreading hairs, glandular, green to purplish; rays mostly ca 50–100, white, pink, or blue, 5–10 mm long, 0.8–1 mm wide; pappus double; achenes 2-nerved, hairy to almost glabrous. Sagebrush, juniper, ponderosa pine, aspen, spruce-fir, and alpine meadow communities at 1980 to 3180 m in Beaver, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Kane, Millard, San Juan, Sanpete, Sevier, Summit, Washington, and Wayne counties; British Columbia to Nevada, Arizona, and Texas; 63 (xi).

*Erigeron formosissimus* Greene Pretty Daisy. [*E. fructetorum* Rydb.]. Perennial herbs, with a simple or sparingly branched subrhizomatous caudex; herbage variously hirsute, glandular, or glabrous, the stems more or less glandular above, mainly 1.5–3 (4.5) dm tall; basal leaves the largest, mainly 2–10 (15) cm long, 4–10 (15) mm wide, oblanceolate to spatulate; cauline leaves commonly much reduced upward, lanceolate to oblong or ovate; heads 1–6; involucre 10–20 mm wide, 5–8 mm high, the bracts subequal, linear, acuminate, glandular, and more or less hirsute; rays ca 75–150, 8–15 mm long, ca 1 mm wide, blue, pink, or white; pappus double; achenes 2-nerved, hairy. Meadows in aspen and mountain brush communities at 2440 to 1840 m in Grand, Iron, Salt Lake, San Juan, and Sevier counties; Alberta south to Arizona and New Mexico; 5 (i). The species is poorly known in Utah (reports of the species in Iron county are from Cronquist 1947).

*Erigeron garrettii* A. Nels. Garrett Daisy. [*E. controversus* Greene]. Perennial subscapose herbs, with branching caudex, the caudex branches clothed with brown leaf bases; stems 3–23 cm tall, sparingly strigose; basal leaves 1.2–12 cm long, 3–13 mm wide, oblanceolate to spatulate, glabrous, sparingly



ciliate; cauline leaves lacking or greatly reduced; heads solitary; involucre 8–17 mm wide, 5–8 mm high, the bracts finely strigose and obscurely glandular, moderately imbricate; rays ca 20–35, white to pink, 7–13 mm long, 1.4–2.7 mm wide; pappus double; achenes 2-nerved, hairy. Moist cliff faces and crevices at 2750 to 3570 m in Salt Lake, Utah, and Wasatch counties; endemic; 17 (0).

*Erigeron glabellus* Nutt. Smooth Daisy. Perennial or biennial herbs with simple or branched caudices, the caudex, when present, clothed with brown to blackish leaf bases; herbage strigose to hirsute; stems 1–6.5 dm tall, erect or nearly so; basal and lower leaves mainly 3–15 cm long, 3–18 mm wide, oblanceolate, entire or toothed, petiolate; middle cauline leaves lanceolate to linear, reduced upward; heads 1–12 (15), borne on bracteate peduncles; involucre 10–20 mm wide, 5–9 mm high, the bracts subequal to slightly imbricate, acuminate, strigose to strigulose; rays ca 125–175, blue to pink, or white; pappus double; achenes 2-nerved, hairy. Meadows and stream sides at 1370 to 1770 m in Beaver, Cache, Daggett, Davis, Duchesne, Salt Lake, Uintah, Utah, and Wasatch counties; Alaska and Yukon, south to Utah, Colorado, South Dakota, and Wisconsin; 12 (0). This is a tall handsome daisy of lower elevations in Utah.

*Erigeron goodrichii* Welsh Goodrich Daisy. Perennial herbs from a stout taproot and caudex, the caudex branches with dark brown marcescent leaf bases; stems 3–10 cm tall, decumbent-ascending to erect, spreading-hairy; basal leaves 0.4–6 cm long, 1.2–5 mm wide, narrowly oblanceolate, the veins not apparent, pilosulose, obtuse apically; cauline leaves more or less developed, but much reduced upward; heads solitary; involucre 10.5–18 mm wide, 6.4–7.8 mm high; bracts imbricate, spreading villous-pilose with multicellular hairs, thickened basally, green or the apices suffused purplish, the inner with scarious margins, the attenuate apices more or less glandular and sometimes spreading; rays 40–65, pink-purple to pink or white, 6.8–10.4 mm long, 1.5–2 mm wide; pappus apparently single, of 20–30 minutely barbellate bristles; achenes 2-nerved, pilose. Engelmann spruce krummholz and meadow communities, often on rock outcrops or talus

at 3050 to 3400 m in Duchesne, Summit, Uintah, and Utah counties; endemic; 8 (0).

*Erigeron jonesii* Cronq. Jones Daisy. Perennial herbs, from a branching or simple caudex, the caudex branches clothed with blackish or dark brown marcescent leaf bases; herbage hirsute with short spreading hairs; stems mainly 10–25 cm tall, conspicuously decumbent and often purplish at the base; basal leaves 3-nerved, 1.5–8 cm long, 3–12 mm wide, oblanceolate to elliptic or spatulate, petiolate, entire or toothed; cauline leaves smaller than the basal; heads 1–4; involucre 9–15 mm wide, 5–7 mm high, the bracts glandular and spreading-hairy, slightly thickened dorsally, more or less imbricate, green, with tips often purplish; rays ca 25–50, blue, pink, or white, 4–8 mm long, 1.4–1.8 mm wide; pappus single or with a few short outer setae; achenes 2-nerved, hairy. Sagebrush, pinyon-juniper, mountain brush, and alpine meadow communities at 1890 to 3350 m in Juab, Tooele, and Washington counties; Nevada; 5 (iii). The Jones daisy simulates *E. eatonii* in habit and stature, but the definite spreading hairs of the herbage are apparently definitive in most instances. Possibly it would best be treated at some infraspecific rank within *E. eatonii*.

*Erigeron kachinensis* Welsh & Moore Kachina Daisy. Perennial herbs, from a short thick branching or simple caudex, the caudex branches clothed with brown marcescent leaf bases; herbage glabrous throughout; stems 6–18 cm tall, decumbent to erect; basal leaves 1.3–5 cm long, 2–13 mm wide, oblanceolate to obovate or spatulate, the blade tapering to the petiole, rounded or retuse apically, entire; cauline leaves 5–11, reduced upward; heads solitary or 2–4, the involucre 5–6 mm broad, 3.2–4 mm high, the bracts distinctly imbricate, some purplish at the tip, glabrous or minutely glandular; rays 10–15, white or pinkish, 3.5–5.5 mm long, 0.9–1.1 mm wide; pappus double; achenes 2-nerved, hairy. Seeps and hanging gardens at 1680 to 1890 m in White (type from Natural Bridges National Monument) and Dark Canyons, San Juan County, Utah, and Montrose County, Colorado; 3 (ii). This distinctive dwarf daisy is a Colorado Plateau endemic.

*Erigeron leiomerus* Gray Glaber Daisy. Perennial herbs, from a branching caudex,

the caudex branches clothed with brown marcescent leaf bases; herbage glabrous or merely strigose; stems 4–12 (15) cm tall, decumbent to erect; basal leaves 1.3–7 cm long, 2–11 (15) mm wide, oblanceolate to spatulate or obovate, rounded to retuse apically, enlarged and often purplish basally, glabrous or strigose to glabrate; cauline leaves reduced upward, usually several, becoming acutish; head solitary, the involucre 7–13 mm wide, 4–6 mm high, the bracts somewhat imbricate, purplish overall or at tips, finely glandular; rays ca 15–60, purplish to blue or white, 6–11 mm long, 1.5–2.5 mm wide; pappus double; achenes 2-nerved, short-hairy. Talus slopes, boulder fields, and meadows in spruce and lodgepole pine and alpine tundra communities at 2950 to 3750 m in Beaver, Box Elder, Cache, Daggett, Duchesne, Juab, Piute, Salt Lake, Summit, Tooele, and Uintah counties; Nevada and Idaho to Wyoming, Colorado, and New Mexico; 27 (x).

*Erigeron linearis* (Hook.) Piper [*Daucopappus linearis* Hook.]. Perennial herbs from a pluricipital caudex, the branches of the caudex clothed with broad clasping brownish marcescent leaf bases; herbage strigose; stems 5–20 cm tall; basal leaves 1–9 cm long, 0.5–3 mm wide, linear to linear-oblanceolate, acute, the bases enlarged, more or less sheathing, straw colored and strongly ciliate; cauline leaves reduced upward; heads solitary or 2 or 3; involucre 8–13 mm wide, 4–7 mm high, strigose-villous with multicellular hairs and more or less glandular; bracts subequal to somewhat imbricate, green or greenish to straw colored, attenuate, thickened dorsally; rays ca 20–45, yellow, 4–11 mm long, 1.3–2.5 mm wide; pappus double, the inner of 10–20 barbellate bristles, the outer of scales; achenes 2-nerved, short hairy. Sagebrush and juniper communities at 1675 to 2000 m in Box Elder County; British Columbia, Washington, and Oregon, east to Idaho and Wyoming, and south to Nevada; 1 (0).

*Erigeron lonchophyllus* Hook. Short-lived perennial or biennial (?) herbs, with slender taproots and subfibrous roots from a poorly developed caudex; stems decumbent to erect, 5–55 (60) cm long, sparsely to densely spreading-hairy; basal leaves oblanceolate to spatulate, 1.2–11 (15) cm long, 2–12 mm wide; cauline leaves several to many, mostly

0.6–8 cm long, 2–6 mm wide; heads few to numerous, rarely solitary, borne on nearly erect peduncles; involucre 4–9 mm high, 7–17 mm wide, the bracts evidently imbricate, not especially thickened basally, greenish to brownish or yellowish, the tips commonly purplish, sparsely to moderately strigulose with multicellular hairs; rays numerous, white or pinkish, about 2–4 mm long, lacking inner eligulate pistillate corollas; pappus of ca 20–30 slender barbellate white bristles, surpassing the disk corollas; achenes 2-nerved, sparsely hairy. Marshes, stream banks, seeps, and wet meadows at 1370 to 2900 m in Beaver, Daggett, Duchesne, Garfield, Grand, Juab, Piute, Rich, Salt Lake, Sanpete, Sevier, Summit, Tooele, Utah, and Washington counties; Alaska and southern Yukon, south to California and New Mexico, and east to Quebec and South Dakota; 39 (vii).

*Erigeron maguirei* Cronq. Maguire Daisy. Perennial herbs, with a branching caudex, the caudex branches clothed with brown to straw-colored marcescent leaf bases; herbage spreading hirsute; stems 7–18 cm high, decumbent to sprawling or erect; basal leaves 2–5 cm long, 3–8 mm wide, oblanceolate to spatulate, rounded apically; cauline leaves well developed, but somewhat reduced upward, becoming acutish; heads solitary or 2–5; involucre 5–6.5 mm high, 7–11 mm wide, the bracts imbricate, not much thickened, green or yellowish, the inner less pubescent and with scarious purplish tips, all finely glandular also; rays 12–20, white or pinkish, ca 6–8 mm long, 1.1–2 mm wide; pappus of 13–25 slender barbellate sordid bristles, with a few shorter outer ones; achenes 2-nerved, hairy. Canyon bottoms in Wingate (?) and Navajo formations at 1640 to 1740 m in Emery and Wayne counties; endemic; 5 (ii). For the past four decades the Maguire daisy was known officially from the type locality in the San Rafael Swell in Emery County. Now, other material has been discovered at BRY and relocated in the field, which is distinguishable only technically from specimens at the type locality. These latter specimens tend to have more heads per stem, have narrower ray corollas, and shorter disk corollas. All of these may be the result of ecological responses, but they are recognized as var. *harrisonii* Welsh.



*Erigeron mancus* Rydb. [*E. pinnatisectus* (Gray) A. Nels. var. *insolens* Macbr. & Pays.]. Pulvinate caespitose subscapose perennials from a usually branched caudex, the caudex clothed with dark brown to straw-colored marcescent leaf bases; herbage more or less hirtellous and puberulent or minutely glandular; stems mainly 2–6 cm long, erect or ascending; basal leaves 1.2–4 cm long, 2–4 mm wide, pinnatifid, the lobes lanceolate, sometimes again lobed; cauline leaves much reduced; heads solitary; involucre 5–6.5 mm high, 7–12 mm wide, glandular, villous with multicellular hairs, the bracts subequal, somewhat thickened basally, the acuminate tips often purplish; ray flowers lacking; pappus simple or nearly so, of 20–30 bristles; achenes 2-nerved, hairy. Alpine forb and grass-sedge communities at 3050 to 3660 m in the La Sal Mountains, astride the Grand-San Juan County line; endemic; 3 (0).

*Erigeron melanocephalus* (A. Nels.) A. Nels. [*E. uniflorus* var. *melanocephalus* A. Nels.]. Perennial herbs, from a simple or branched caudex, the caudex branches clothed with dark brown marcescent leaf bases; herbage more or less villous with multicellular hairs; stems commonly 5–12 cm tall, erect; basal leaves 0.8–6 cm long, oblanceolate to spatulate, rounded or retuse apically; cauline leaves much reduced upward; heads solitary; involucre 10–14 cm wide, 5–9 mm high, the bracts more or less densely villous with multicellular hairs, the cross-walls black or dark purple, equal, attenuate, green, with purplish tips or purplish throughout; rays 50–70, white or pink, 7–11 mm long, 1.2–2 mm wide; pappus single, of ca 20–25 bristles; achenes 2-nerved, sparsely hairy. Alpine meadows at 3355 to 3720 m in Grand and San Juan counties (La Sal Mountains); Wyoming, Colorado, and New Mexico; 4 (0). Specimens from the Uinta Mountains, which have involucre hairs with purple cross-walls, have been assigned here previously, but they seem to represent nothing more than phases of *E. simplex* (q.v.).

*Erigeron nanus* Nutt. Dwarf Daisy. [*E. inamoenus* A. Nels.]. Perennial herbs, from a branching caudex, the caudex branches clothed with imbricate ashy to straw-colored marcescent leaf bases; stems 3–8 cm high, villous with contorted multicellular hairs, subscapose; basal leaves linear-oblanceolate,

1.2–4 cm long, 1–2 mm wide, hirtellous to sparingly villous or glabrous, ciliate toward base with spreading long hairs, the bases conspicuously enlarged; heads solitary; involucre 7–13 mm wide, 5–8 mm high, long-villous with multicellular hairs and more or less finely glandular; bracts subequal, the midstripe brown to purplish, the margins green to scarious or purplish; rays 15–35, purplish, 5–10 mm long, 1.3–2.4 mm wide; pappus of 15–25 bristles and some outer setae; achenes 2-nerved, hirsute. Sagebrush and sagebrush-grass communities, often on windswept ridges, at 2135 to 3270 m in Box Elder and Daggett counties; Idaho and Wyoming; 5 (0).

*Erigeron nauseosus* (Jones) A. Nels. Marysvale Daisy. [*E. caespitosus* Nutt. var. *nauseosus* Jones, type from near Marysvale]. Perennial herbs, from a stout branching brittle caudex, the branches clothed with dark brown marcescent leaf bases, the taproot similarly colored; stems 6–25 cm tall, ascending to erect, glandular-scarious; basal leaves 2.3–10 cm long, 2–15 mm wide, oblanceolate to spatulate, rounded apically, tapering to the petiole, commonly 3-nerved; cauline leaves well developed, only gradually reduced upward; heads solitary, rarely 2; involucre 8–17 mm wide, 5–8 mm high, finely glandular (rarely sparingly strigose as well); bracts imbricate, somewhat thickened, often purplish, attenuate; rays 30–60, white or purplish, 6–12 mm long, 1.3–2 mm wide; pappus double, the inner of 12–23 bristles, the outer of inconspicuous setae; achenes 2-nerved, hairy. Crevices in limestone, quartzite, and igneous outcrops, and in talus in pinon-juniper, sagebrush, mountain brush, and Douglas fir-white fir communities at 1830 to 2900 m in Beaver, Garfield, Millard, Piute, and Sevier counties; White Pine County, Nevada; a Great Basin endemic; 24 (iii).

*Erigeron nematophyllus* Rydb. Needleleaf Daisy. Perennial herbs, from a branching caudex, the caudex branches clothed with fibrous ashy to brown marcescent leaf bases; herbage strigose to subglabrous; stems 4–15 cm tall; basal leaves 1–8 cm long, 1–3 mm wide, linear to linear-oblanceolate, ciliate near the enlarged sheathing base; cauline leaves few and reduced, not especially exceeding the basal cluster; heads solitary; involucre 6–13 mm wide, 4–6.5 mm high;



bracts more or less imbricate, moderately strigulose, green or brown, the inner often with scarious margins and purplish tips; rays 15–55, white (less commonly pink), 4–8 mm long, 1.2–2.3 mm wide; pappus of ca 15–25 bristles; achenes 2-nerved, shortly hairy. Sagebrush, mountain brush, and pinyon-juniper communities, often on Green River Shale, at 2280 to 2870 m in Carbon, Daggett, Duchesne, and Uintah counties; Wyoming and Colorado; 7 (i).

*Erigeron peregrinus* (Pursh) Greene Strange Daisy. [*E. callianthemus* Greene; *E. peregrinus* ssp. *callianthemus* (Greene) Cronq.; *E. regalis* Greene; *E. peregrinus* var. *eucallianthemus* Cronq.; *E. peregrinus* var. *scaposus* (T. & G.) Cronq.; *E. salsuginosus* var. *scaposus* T. & G.]. Perennial herbs, from a rhizome, the rhizome sometimes short, dark brown; stems 0.9–5.5 (7) dm tall, glabrous or sparingly to moderately villous below, often densely villous below the heads; basal leaves 2–16 (20) cm long, 0.8–3.2 (4.5) cm wide, oblanceolate to spatulate or obovate, tapering or abruptly contracted to the petiole, obtuse or rounded to acute apically, glabrous or rarely sparingly villous, ciliate; cauline leaves reduced upward, becoming sessile and more or less clasping; heads solitary, or 2–6; involucre 12–22 (25) mm wide, 6–9 (11) mm high; bracts subequal, reflexed at the attenuate apices, glandular and purplish throughout; rays ca 30–75, 8–17 (25) mm long, 1.8–4 mm wide, rose-purple to white; pappus of ca 20–30 bristles, sometimes with a few outer setae; achenes 4- to 7-nerved, sparingly hairy. Aspen, spruce-fir, lodgepole pine, and sedge communities at 2280 to 3570 m in Box Elder, Cache, Duchesne, Garfield, Grand (?), Salt Lake, San Juan, Summit, Uintah, Wasatch, Weber, and Washington counties; Alaska south to California and New Mexico; 57 (x). Our materials were segregated by Cronquist (1947) into a dwarf alpine var. *scaposus* (T. & G.) Cronq. and a taller montane var. *eucallianthemus*. On the basis of the rather abundant materials at hand, there does not seem to be any means of recognition of those taxa, except arbitrarily. Thus, all our specimens are herein considered as belonging to ssp. *callianthemus* (Greene) Cronq. var. *callianthemus*.

*Erigeron proselyticus* Nesom Professor Daisy. [*E. flagellaris* Gray var. *trilobatus* Maguire ex Cronq.]. Perennial herbs, from a subrhizomatous or substoloniferous caudex, the caudex branches with weakly persistent brown marcescent leaf bases; stems 14–25 cm tall, decumbent to ascending or erect, sparingly strigose; basal leaves 0.5–6.5 (7.5) cm long, 2–11 mm wide, oblanceolate to spatulate or linear, entire to pinnately few toothed or lobed, glabrous to sparingly strigose, acute to obtuse or rounded apically; cauline leaves gradually to abruptly reduced upward, entire or the lower few toothed; heads 3 to several; involucre 3.5–7 mm wide, 2.5–4.5 mm high, sparingly to moderately hirtellous; bracts subequal, brown, suffused with purple, or the inner greenish, with chartaceous margins; rays 22–46, white to purplish, 5.4–8.5 mm long, 1–1.4 mm wide; pappus double, the inner of 10–19 bristles, the outer of short setae; achenes 2- or 4-nerved, sparsely hairy. Bristlecone pine, spruce-fir, and aspen communities on sandstone and marly limestone formations at 2440 to 3050 m in Iron and Kane counties; endemic; 8 (i).

*Erigeron pulcherrimus* Heller Basin Daisy. Perennial herbs, from a branching caudex, the caudex branches with exfoliating brownish bark, not especially clothed with persistent leaf bases; herbage silvery or grayish strigose; stems (5) 9–32 (35) cm tall, erect; basal leaves 0.8–7 cm long, 1–3 (5) mm wide, linear to linear-oblanceolate; cauline leaves reduced upward, but generally developed to stem middle or above; heads solitary; involucre 10–20 mm wide, 6–9 mm high, coarsely villous with spreading-ascending, multicellular hairs, obscurely glandular apically; bracts imbricate, greenish, the midrib often brown, the margins chartaceous, acuminate-attenuate, especially the inner; rays ca 25–60, white, pink, or violet, 8–15 mm long, 2–3.7 mm wide; pappus of ca 30–50 bristles, the outer series more or less developed; achenes (2-) 3- to 5-nerved, densely hairy. Salt desert shrub and pinyon-juniper communities on saline and seleniferous clays, clay-silts, and gravelly pediments at 1310 to 2105 m in Carbon, Duchesne, Emery, Grand, Uintah, and Wayne counties; Wyoming, Colorado, and New Mexico. Our materials have been treated as belonging to a wide-leaved (1.5–5

mm) var. *wyomingia* (Rydb.) Cronq. and a narrow-leaved (1–1.5 mm) var. *pulcherrima*. However, only arbitrary segregation appears to be possible, and it seems best not to attempt recognition of infraspecific taxa; 61 (xiv).

***Erigeron pumilus* Nutt.** Vernal Daisy. Perennial herbs, arising from a caudex, the branches clothed with ashy to brown marcescent leaf bases; herbage more or less hirsute with spreading hairs; stems 4–50 cm tall, leafy or subscapose; basal leaves 0.4–8 cm long, mostly 2–5 mm wide, linear-oblongate to oblanceolate; cauline leaves well developed, somewhat reduced, or much reduced upward, or almost lacking; heads solitary or few to numerous; involucre 7–15 mm wide, 4–7 mm high, sparingly to densely spreading-villous with multicellular hairs; bracts subequal, acuminate to attenuate, green, with brownish midrib; rays mostly 50–100, white or pink to lavender, 6–15 mm long, 0.7–1.5 mm wide (or more); pappus double, the inner of 7–20 coarse bristles, the outer of evident bristles or scales; achenes 2-nerved, sparsely to moderately hairy. Blackbrush, shadscale, sagebrush, pinyon-juniper, and mountain brush communities at 885 to 2960 m in all Utah counties; Washington to Saskatchewan, south to California, Arizona, New Mexico, and Kansas. Our highly variable material was segregated on technical characteristics by Cronquist (1947) into two subspecies, each with two varieties. The bulk of the Utah specimens belong to ssp. *concinoides* Cronq., segregated in large measure from the much less common and more northern ssp. *intermedius* Cronq. by the fewer (7–15, not 13–20) inner pappus bristles and evidently puberulent (not glabrous or slightly puberulent) corolla tubes. The varieties *intermedius* (var. *euintermedius* Cronq.) and *gracilior* Cronq. of ssp. *intermedius* are only arbitrarily separable by stem thickness and head number. The weakly segregated varieties within ssp. *concinoides*, var. *concinoides* (var. *euconcinoides* Cronq.) and var. *condensatus* (D. C. Eaton) Cronq., differ in degree of development of cauline leaves, with the former having more equably leafy stems and the latter tending to be subscapose. It seems best to treat our material as belonging to two variable taxa; ssp. *intermedius* and ssp. *concinoides*; 212 (xxvi).

***Erigeron religiosus* Cronq.** Religious Daisy. Short-lived perennial (or biennial?) herbs from a slender taproot and poorly developed caudex; herbage more or less strigose and glandular below the heads; stems 6–35 cm tall, decumbent-ascending to erect; basal leaves 2–5.5 (7) cm long, 2–8 mm wide (or more), oblanceolate to spatulate, entire or some pinnately toothed or lobed; cauline leaves gradually reduced upward; heads 2 to numerous; involucre 5.5–7.5 mm wide, 2–3.5 mm high, sparingly to moderately villous and more or less glandular; bracts with brown midrib, somewhat thickened, scarious apically; rays 35–85, white or pinkish, 3.4–6.8 mm long, 0.5–1.4 mm wide; pappus double, the inner of 6–12 bristles, the outer of short setae; achenes 2-nerved, sparsely hairy. Ponderosa pine-oak and pinyon-juniper communities at 1525 to 1830 m in Kane and Washington (type from Clear Creek Canyon) counties; endemic; 9 (iv).

***Erigeron simplex* Greene** Greene Daisy. Perennial herbs, from a simple or branched caudex, the caudex clothed with dark brown marcescent leaf bases; herbage more or less viscid-villous with multicellular hairs; stems commonly 2–15 (20) cm tall; basal leaves 0.8–6 (8) cm long, 2–10 (13) mm wide, oblanceolate to spatulate, obtuse to abruptly acute or mucronate apically; cauline leaves reduced; heads solitary; involucre 8–22 mm wide, 5–10 mm high, moderately to densely villous and somewhat viscid, the hairs with clear to reddish purple or purplish black cross-walls; bracts equal, suffused with purple or green, appressed or some reflexed; rays 50–125, blue-purple to pink (or white), 7–11 mm long, 1.2–2.5 mm wide; pappus double, the inner of ca 10–15 barbellate bristles, the outer of conspicuous setae; achenes 2-nerved, sparsely hairy. Lodgepole pine, Engelmann spruce, alpine fir, and alpine meadow and tundra communities at 3355 to 3660 m (in Deep Creek, Tushar, La Sal, and Uinta mountains) in Beaver, Daggett, Duchesne, Juab, Piute, San Juan, Summit, and Uintah counties; Oregon to Montana, south to Nevada, Arizona, and New Mexico; 30 (vi). Our variable materials include specimens with purplish-black cross-walls of the multicellular hairs, especially on the involucre and below the heads. These have been placed with the

similar and related *E. melanocephalus* (q.v.), but differ in shape of lower leaves and general aspect of the plants.

*Erigeron sionis* Cronq. Zion Daisy. Low perennial herbs, with short stoloniferous branches arising from a slender taproot; stems 1.5–13.5 cm long, decumbent to erect, glabrous or appressed pubescent; basal leaves 0.5–3.5 cm long, 2–10 mm wide, oblanceolate to obovate, entire or more commonly 3- to 5-lobed, glabrous or sparsely strigose; heads solitary or 2 to several; involucre 5–7 mm wide, 2–3 mm high, glandular and sparsely to moderately spreading-hairy; bracts suffused purplish or the inner green with chartaceous margins; rays 23–38, white, the midstripe below purplish, 3.9–6.1 mm long, 1–1.6 mm wide; pappus double, the inner of 7–13 bristles, the outer of slender setae; achenes 2-nerved, sparsely pubescent. Seeps and hanging gardens in ponderosa pine and riparian communities in Navajo and Wingate sandstones at 1350 to 1600 m in Zion National Park, Washington and Kane (?) counties; endemic; 3 (i).

*Erigeron speciosus* (Lindl.) DC. Oregon Daisy. Rhizomatous perennial herbs with the caudex more or less developed; stems 1.5–9 cm tall, ascending to erect, spreading-hairy to subglabrous or glandular above; basal leaves often lacking at anthesis, the lower-

most cauline ones oblanceolate to spatulate, petiolate, commonly 5–15 cm long, 4–20 mm wide; middle cauline leaves lanceolate to oval, oblanceolate, or elliptic, 2–11 cm long, 5–28 mm wide; upper leaves gradually to markedly reduced, lanceolate to obliquely ovate, ciliate, the surfaces glabrous, spreading-hairy, or glandular (or a combination); heads 1–15 (or more); involucre 11–22 mm wide, 5.5–9 mm high, glandular, with a few long hairs, or more or less spreading-hairy; bracts subequal, acuminate or attenuate, the tips more or less spreading, often suffused purplish; ray flowers ca 75–150, pink, pink- or blue-purple, or white, 7–18 mm long, 0.7–1 mm wide; pappus double, the inner of 20–30 bristles, the outer of more or less evident setae; achenes 2- to 4-nerved, hairy. The *speciosus* complex in Utah, as herein interpreted, consists of four variable, and more or less intergrading, largely sympatric infraspecific taxa. All have been treated previously at specific rank, or they have been treated within *E. speciosus*, in part. Cronquist (1947) discussed the problem of intermediacy in the complex but hesitated to combine the taxa because “such a treatment would distort the facts as well as being unwieldy.” It is here contended that they are unwieldy apart; it seems therefore best to combine them as follows:

1. Leaves spreading-hairy on one or both surfaces; involucre spreading-hairy and more or less glandular ..... *E. speciosus* var. *mollis*
- Leaves glabrous on both surfaces or minutely glandular, or with minute strigose hairs, rarely with a few spreading multicellular hairs ..... 2
- 2(1). Leaves glandular on the surfaces (especially the upper ones), and also ciliate ....  
..... *E. speciosus* var. *uintahensis*
- Leaves glabrous on both surfaces, ciliate ..... 3
- 3(2). Involucral bracts merely glandular, rarely also somewhat spreading-hairy; upper leaves often ovate ..... *E. speciosus* var. *macranthus*
- Involucral bracts glandular and commonly also spreading-hairy; upper leaves lance-attenuate ..... *E. speciosus* var. *speciosus*

**Var. *macranthus* (Nutt.) Cronq.** [*E. grandiflorus* Nutt., not Hook.; *E. macranthus* Nutt.]. Sagebrush, snowberry, aspen, spruce-fir, and alpine meadow communities at 1760 to 3420 m in Beaver, Box Elder, Cache, Carbon, Duchesne, Emery, Garfield, Grand, Juab, Kane, Millard, Piute, Rich, Salt Lake, Sanpete, Sevier, Tooele, Utah, Wasatch,

Washington, and Weber counties; Washington and Alberta south to Nevada, Arizona, and New Mexico; 104 (xv). This is our most common phase, but it is only arbitrarily separable from var. *speciosus*, to which it is completely transitional.

**Var. *mollis* (Gray) Welsh** comb. nov. [based on: *Erigeron glabellus* var. *mollis* Gray



Proc. Acad. Nat. Sci. Philadelphia 1863: 64. 1864.]. Aspen, spruce-fir, and meadow communities at 2070 to 3050 m in Carbon, Duchesne, Garfield, Grand, Juab, Salt Lake, San Juan, Sanpete, Sevier, Uintah, Utah, and Wasatch counties; Montana to South Dakota, and south to New Mexico and Nebraska; 20 (i). This variety includes what has traditionally been called *E. subtrinervis* Rydb.

**Var. *speciosus*** [*Stenactis speciosa* Lindl.]. Mountain brush, sagebrush, ponderosa pine, aspen, spruce-fir, and alpine meadows at 2040 to 3300 m in Duchesne, Garfield, Grand, Iron, Juab, Piute, San Juan, Sanpete, Sevier, and Utah counties; British Columbia and Montana, south to Nevada and New Mexico; 23 (iv).

**Var. *uintahensis*** (Cronq.) Welsh comb. nov. [based on: *Erigeron uintahensis* Cronq. Bull. Torrey Bot. Club 70: 270. 1943]. Sagebrush, mountain brush, ponderosa pine, aspen, lodgepole pine, spruce-fir, and alpine meadow communities at 2070 to 3420 m in Beaver, Carbon, Daggett, Duchesne, Juab, Piute, Sanpete, Sevier, Summit, Uintah, Utah, and Wasatch counties; Wyoming; 39 (vi). The glandular condition of the leaves varies in amount and position, and the Uinta phase passes by degree into other taxa of the *speciosus* complex. Because of the intergradation it seems best that this most distinctive portion of the variation should be treated within an expanded *E. speciosus*.

***Erigeron superbus* Greene ex Rydb.** Splendid Daisy. Rhizomatous perennial herbs and with the caudex more or less developed, the perennating branches bearing brown marcescent leaf bases; herbage glabrous or glandular above and villous in some below the heads; stems 1–6 dm tall, erect; basal leaves smaller than the cauline and commonly present at anthesis, 3–15 cm long, 6–25 (33) mm wide, oblanceolate to obovate or spatulate, petiolate; middle cauline leaves somewhat smaller than the lower ones, oblong to elliptic or lanceolate, glandular (glabrous), the uppermost sessile and glandular, rarely some denticulate, not ciliate; heads 1–7; involucre 11–19 mm wide, 7–10 mm high; bracts subequal, glandular, sometimes with long spreading hairs near the base, acuminate, sometimes suffused purplish; rays 40–95, 1–2 mm wide,

12–20 mm long, rose-purple or white; pappus double, the inner of 20–25 pinkish or tawny bristles, the outer of setae; achenes 2-nerved, hairy. Aspen, Douglas fir, lodgepole pine, and spruce-fir communities at 2250 to 3050 m in Carbon, Garfield, Kane, Piute, San Juan, Summit, and Uintah counties; Wyoming south to Arizona and New Mexico; 18 (v).

***Erigeron tener* Gray** Thin Daisy. Perennial herbs, from a branching caudex, the slender branches with ashy to brownish marcescent leaf bases; herbage strigose; stems slender, decumbent, ascending, or erect, 3–15 cm tall; basal leaves 1–7.5 cm long, oblanceolate to elliptic, rhombic, or obovate, petiolate, acute to obtuse apically; cauline leaves much reduced; heads solitary or 2 or 3; involucre 6–10 (12) mm wide, 3.5–5 mm high, glandular and with spreading multicellular hairs; bracts imbricate, somewhat thickened, brownish, the inner membranous or somewhat scarious, sometimes suffused with purple; rays ca 15–40, purplish or white, 4–8 mm long, 1–1.7 mm wide; pappus double, the inner of 15–30 bristles, usually with slender outer setae; achenes 2-nerved, hairy to subglabrous. Sagebrush, mountain brush, pinyon-juniper, and white fir–Douglas fir communities, often on limestone outcrops at 1980 to 2900 m in Beaver, Juab, Millard, Rich, Sanpete, Tooele, and Utah counties; Oregon to Wyoming south to California and Nevada; 10 (i).

***Erigeron untermannii* Welsh & Goodrich** Untermann Daisy. Perennial pulvinate herbs with an intricately branched caudex, the caudex branches mainly basal, 0.8–3.3 cm long, 1–4 mm wide, narrowly oblanceolate to spatulate, pilosulose with ascending, often curved, hairs; scapes 2–6 cm tall; heads solitary; involucre 7–11 mm wide, 5–5.7 mm high, the bracts more or less imbricate, green, or the inner somewhat chartaceous, the margins hyaline, the tips suffused with purple (sometimes throughout), densely hispidulous with short spreading hairs; rays 14–26, white, 4–6.5 mm long, 1.5–2.1 mm wide; pappus apparently single, of ca 20 slender fragile bristles; achenes 2-nerved, pilose. Pinyon-juniper community on calcareous shales and sandstones of the Uinta and Green River formations at 2135 to 2380 m in Duchesne and Uintah counties; endemic; 4 (0).

*Erigeron ursinus* D.C. Eaton Bear Daisy. Perennial rhizomatous sod-forming herbs, the perennating organs arising from short superficial branches clothed with brown marcescent leaf bases; herbage subglabrous to strigose or variously ascending- or spreading-hairy; stems ascending, 5–25 (30) cm tall; basal leaves 1.2–12 cm long, 2–11 mm wide, oblanceolate to oblong, commonly acute or acutish apically, ciliate, the surfaces glabrous or variously hairy; cauline leaves reduced upward; heads solitary or 2 or 3; involucre 9–19 mm wide, 5–7 mm high, glandular and spreading-hairy with multicellular heads; bracts subequal, green or suffused purplish at the usually reflexed tips; rays ca 30–100, pink or blue-purple, 6–15 mm long, 1–2 mm wide; pappus double, the inner of ca 10–20 bristles, the outer of setae or scales; achenes 2-nerved, hairy. Sagebrush, aspen, lodgepole pine, and spruce-fir communities, often in forb-grass or forb-sedge meadows at 2440 to 3660 m in Beaver, Cache, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane,

Piute, San Juan, Sanpete, Sevier, Summit, Uintah, Utah, Wasatch, and Wayne counties; Idaho and Montana, south to Nevada and Arizona; 95 (x).

*Erigeron utahensis* Gray Utah Daisy. Perennial herbs from a branching caudex, the branches with grayish marcescent leaf bases and usually densely clothed with white villous-pilose hairs; stems 10–60 cm tall, erect, appearing grayish or silvery due to strigose hairs; basal and lowermost cauline leaves 1.5–10 cm long, 1–6 mm wide, linear-oblanceolate, commonly withered or lacking at anthesis; cauline leaves gradually reduced upward; heads solitary or few to many; involucre 5–15 mm wide; 3–7 mm high, strigose and often glandular apically; bracts imbricate, brownish, the inner with scarious margins; rays ca 10–40, blue, pink, or white, 4–18 mm long, 1–2.7 mm wide; pappus double, the inner of ca 20–30 bristles, the outer of setae; achenes 4-nerved, more or less pilose. Two rather weakly separable varieties are present in Utah, as follows:

1. Stem bases not densely white-pilose; involucre mainly less than 8 mm wide; plants uncommon ..... *E. utahensis* var. *sparsifolius*
- Stem bases densely white-pilose; involucre commonly more than 10 mm wide; plants common ..... *E. utahensis* var. *utahensis*

**Var. *sparsifolius* (Eastw.) Cronq.** [*E. sparsifolius* Eastw. and *Wyomingia vivax* A. Nels, both types from San Juan County]. Sandstone outcrops in salt desert shrub and pinyon-juniper communities, often in shaded mesic areas, at 1220 to 1900 m in Emery, Garfield, Kane, and San Juan counties; Colorado and Arizona; 9 (iv).

**Var. *utahensis* [E. *stenophyllus* var. *tetrapleuris* Gray].** Creosote bush, blackbrush, warm desert shrub, pinyon-juniper, and Mountain brush communities at 900 to 2000 m in Emery, Garfield, Grand, Iron, Kane, San Juan, Washington, and Wayne counties; Colorado and Arizona; 75 (vii).

***Erigeron vagus* Payson** Payson Daisy. Caespitose perennial herbs, from a diffuse caudex, the branches commonly soboliferous; herbage moderately villous and glandular; leaves mainly basal, tufted at the apex of the caudex branches, 0.5–2.5 cm long, palmately 3-toothed or -lobed; heads solitary, subscapose; involucre 8–16 mm wide, 5–7.5 mm

high, spreading-hairy and more or less glandular; bracts subequal, commonly suffused purplish at the attenuate apices; rays ca 25–35, white or pink, 4–7 mm long, 1–2 mm wide; pappus simple, of about 20 bristles; achenes 2-nerved, sparingly hairy. Ponderosa pine western bristlecone pine, and sedge-forb communities at 2375 to 3660 m in Garfield, Grand, Iron, and San Juan counties; California east to Colorado; 9 (0).

***Erigeron wahwahensis* Welsh** Wah Wah Daisy. Perennial herbs, from a branched caudex, the caudex branches with conspicuous fibrous brown to ash-colored marcescent leaf bases; stems 15–40 cm long, decumbent to ascending; basal leaves 3–18 cm long, 4–13 mm wide, linear-oblanceolate to oblanceolate or elliptic, 3-nerved, petiolate, appressed to spreading-hairy with curved hairs; cauline leaves reduced, sessile, and bracteate above; heads solitary or 2 or 3; involucre 13–17 mm wide, 6–7 mm high, spreading-villous with multicellular hairs, glandular apically; bracts

imbricate, green, the tips reddish, thickened basally; rays 30–40, pink or white, 5.5–7 mm long, 1.7–2.2 mm wide; disk corollas 3.5–4.2 mm long, the tube ca 2 mm long, the lobes 0.4 mm long; pappus of 15–20 bristles, with inconspicuous outer setae; achenes 2-nerved, short-hairy. Sagebrush, oak-maple, and piñon-juniper communities at 1670 to 2440 m in Beaver and Washington counties; endemic; 7 (iii). The Wah Wah daisy stands between the distributions of *E. jonesii* and *E. eatonii*, and it shares features of both. The specimens examined from Washington County have appressed strigose stems, and are highly variable. Those from the Wah Wah Mountains have spreading hairy stems. Additional work is indicated.

### ERIOPHYLLUM Lag.

Annual or perennial woolly herbs; leaves alternate, entire or toothed to lobed; heads solitary or corymbosely clustered; radiate; rays few, pistillate and fertile, yellow or white; involucre campanulate or hemispheric; bracts 1 (apparently 2) -seriate, firm, erect; receptacle flat to low-conic, naked; disk flowers perfect, fertile, the tube glandular or hairy; pappus of firm nerveless chaffy scales; style branches flattened; achenes 4-angled.

CONSTANCE, L. 1937. A systematic study of the genus *Eriophyllum*. Univ. California Publ. Bot. 18: 69–136.

- |       |   |                    |
|-------|---|--------------------|
| 1.    | Plants perennial .....  | <i>E. lanatum</i>  |
| —     | Plants annual .....   | 2                  |
| 2(1). | Rays white; pappus of unequal scales .....                            | <i>E. lanosum</i>  |
| —     | Rays yellow; pappus of equal scales or reduced to a short crown ..... | <i>E. wallacei</i> |

*Eriophyllum lanatum* (Pursh) Forbes Perennial herbs, the herbage tomentose; stems erect or decumbent from a ligneous base, mainly 10–20 cm tall; leaves mainly 1–4 cm long, entire or 3- to 5-toothed or -lobed; heads solitary or corymbose on naked peduncles 3–10 cm long; involucre campanulate, 6–10 mm wide, 6–8 mm high; bracts 5–8 (10), carinate, distinct, the tips erect; rays 5–8 (10), yellow, 6–10 mm long, 2–5 mm wide; pappus of 8–10 variable scales; achenes 2.5–4 mm long, 4-angled, variously glabrous, hairy, or glandular. Sagebrush community (reported from Utah in the Pacific Northwest Flora); British Columbia to Montana, south to California, Nevada, and Wyoming; 0 (0). Our material likely belongs to var. *integrifolium* (Hook.) Smiley.

*Eriophyllum lanosum* (Gray) Gray [*Acetinolepis lanosa* Gray]. Annual floccose-tomentose herbs; stems mainly 2–10 cm tall, simple and erect or branching from the base; leaves 0.5–1.8 cm long, 1–2 mm wide, linear to linear-oblongate, entire or essentially so; heads turbinate, solitary on naked peduncles 0.5–5 cm long; involucre 5–6.5 mm wide, 5–7 mm high; bracts 8–10, oblong, acute, distinct or nearly so; rays 5–10, white, 3–5 mm long, 2.5–3.5 mm wide; pappus of ca 5 slender hyaline awn-tipped scales; achenes

2.5–4.5 mm long, slender, sparsely strigulose. Creosote bush, blackbrush, and Joshua tree communities at 700 to 900 m in Washington County; California, Nevada, and Arizona; 13 (i).

*Eriophyllum wallacei* (Gray) Gray [*Bahia wallacei* Gray]. Annual tomentose herb; stems mainly 1–8 cm tall, simple or branched from the base; leaves 0.5–1.5 cm long, spatulate to obovate, entire or 3-lobed; heads solitary, turbinate-cylindric, on short peduncles; involucre 4–6 mm wide, 5–7 mm high; bracts 6–10, ovate, distinct; rays 5–10, yellow, 3–4 mm long, 2.5–3.5 mm wide; pappus of 6–10 scales or none; achenes ca 2 mm long, linear, hairy or glabrous. Larrea, blackbrush and Joshua tree communities at 700 to 900 m in Washington Co.; California, Nevada, Arizona, and Mexico; 32 (iii).

### EUPATORIUM L.

Perennial herbs; leaves alternate, opposite, or whorled, simple; heads discoid, the flowers all perfect and tubular; involucre cylindric to campanulate, the bracts striate, imbricate; receptacle naked, mainly flat; anthers obtuse and entire basally, or minutely sagittate; style branches with short stigmatic lines and an elongate papillate appendage; pappus of numerous capillary bristles; achenes 10-nerved.



1. Leaves alternate; plants of Box Elder County ..... *E. occidentale*
- Leaves opposite or whorled; plants of various distribution ..... 2
- 2(1). Leaves opposite; flowers white to cream ..... *E. herbaceum*
- Leaves whorled; flowers purple or purplish ..... *E. maculatum*

*Eupatorium herbaceum* (Gray) Greene [*E. ageratifolium* var.? *herbaceum* Gray]. Perennial herbs from a woody caudex; stems 4–7 dm tall, branched above; herbage scabrous-puberulent; leaves mainly opposite, the blades 1.5–6 cm long, 0.5–4 cm wide, ovate, the bases cordate or truncate, coarsely crenate-serrate, acute; heads numerous, in dense corymbose clusters; involucre 3.5–5 mm wide, 3–4 mm high; bracts green, puberulent, subequal; corollas white; achenes black, 1.5–2 mm long. Ponderosa pine and spruce-fir communities at 1585 to 2745 m in Piute and Washington counties; California and Arizona; 2 (ii).

*Eupatorium maculatum* L. Joe-Pye Weed. [*E. bruneri* Gray]. Robust perennial herbs from short subrhizomatous caudices; stems mainly 6–15 dm tall, branching in the inflorescence; herbage puberulent and glandular-dotted; leaves in whorls of 3 or 4, mainly 6–25 cm long and 1.5–7 cm wide, lanceolate to lance-elliptic or lance-ovate, sharply serrate; heads numerous in corymbose clusters; involucre 3.5–5 mm wide, 6.5–9 mm high, the outer puberulent, the inner glabrous dorsally, often ciliate, purplish to straw colored; flowers purple; achenes ca 3 mm long, green to brown, glandular-dotted. River and canal banks, wet meadows, bogs, and seeps at 1370 to 1865 m in Box Elder, Cache, Kane, Uintah, and Utah counties; British Columbia to Newfoundland, south to New Mexico, Illinois, and Michigan. Our material belongs to var. *bruneri* (Gray) Breitung; 15 (i).

*Eupatorium occidentale* Hook. Perennial herbs from a rhizome and with a branching caudex; stems 1.5–7 dm tall, often branched above; herbage scabrous-puberulent; leaves alternate, the blades mainly 1.5–6 cm long, 0.6–3 cm wide, deltoid or deltoid-ovate, serrate or subentire; heads numerous, in compact corymbose clusters; involucre 3–5 mm wide and as high; bracts subequal, puberulent, green or suffused with purple; flowers pink or purplish; achenes ca 3 mm long, brown, glandular-dotted. Rock crevices and talus (usually in quartzite) at 2135 to 2745 m

in Box Elder and Tooele counties; Washington to Idaho, south to California and Nevada; 2 (0).

#### FILAGO L.

White-tomentose annual herbs; leaves entire, alternate; heads discoid, small, in capitate clusters; involucre reduced, the bracts resembling those of the receptacle; outer flowers pistillate, fertile, with tubular-filiform corolla, in several series, the outer epappose and subtended by concave, partly enclosing bracts, the inner bractless and with pappus of capillary bristles; central flowers 2–5, apparently perfect, but often sterile, bractless, with capillary bristles; achenes subterete, nerveless.

*Filago californica* Nutt. Annual herbs, the stems erect, simple or branched above, 0.5–3 dm tall; leaves 0.8–2 cm long, narrowly oblong to oblanceolate; heads ovoid, 3–4 mm high, subequal to involucre leaves; bracts of outer pistillate flowers 8–10, tomentose, boat shaped, the tips hyaline, the inner ones thinner and less hairy, the inner florets ca 12–20; inner achenes papillose. Warm desert shrub at 915 to 1070 m in Washington County; Arizona and California; 3 (2).

#### FLAVERIA JUSS.

Annual herbs; leaves opposite, sessile, more or less connate; heads several to numerous, in compact corymbose clusters; involucre cylindrical; bracts carinate, striate, 2–5, subequal; receptacles naked; ray flowers pistillate, fertile, commonly 1 per head, yellowish, inconspicuous; disk flowers 2–5, perfect, fertile, yellowish; anthers not caudate at the base; pappus none; achenes 8- to 10-ribbed, glabrous.

*Flaveria campestris* J.R. Johnst. Plants 12–85 cm tall, simple or branched, glabrous or hairy at the nodes; leaves 1–8 cm long, 0.4–1.5 cm wide, lance-oblong to linear, serrate to subentire, commonly 3-veined, glabrous; inflorescence leafy bracted; involucre 5–8 mm high, the longer inner bracts mostly 3, strongly keeled, glabrous;

rays ca 1–2 mm long; achenes black, ca 3 mm long. Sand bars, stream banks, and seeps at 1220 to 1680 m in Grand and Tooele counties; Colorado to Missouri, south to New Mexico and Texas; 7 (iii).

GAILLARDIA Foug.

Perennial (or biennial or annual) herbs; leaves alternate or mainly basal, entire or

pinnatifid; heads radiate, the rays yellow, 3-lobed, neuter or sometimes pistillate and fertile; involucre 2- or 3-seriate, herbaceous, more or less spreading, reflexed in fruit; receptacle convex, with numerous setae; disk flowers perfect, fertile; anthers auricled at the base; pappus of 5–10 scarious, awned scales; achenes broadly obpyramidal, long-hairy.

1.

Disk flowers purple or purplish .....

2
- Disk flowers yellow .....

3
- 2(1).

Base of involucre bracts densely long-villous or the corolla lobes 5–11 mm long, or both; plants mainly montane in northeastern Utah .....

*G. aristata*
- Base of involucre bracts not especially hairy, the corolla lobes mainly less than 5 mm long; plants of lower elevations in southeastern to southwestern Utah .....

*G. pinnatifida*
- 3(1).

Stems with well developed, pinnately dissected cauline leaves; plants of canyon bottoms of the Tavaputs Plateau .....

*G. flava*
- Stems subscapose, or, if the cauline leaves well developed, merely toothed or lobed, and plants mainly of other distribution .....

4
- 4(3).

Pappus scales broadly oblong or oval, awnless or abruptly short awned; plants annual, reported for southern Utah .....

*G. arizonica* Greene
- Pappus scales oblong-lanceolate, awned; plants perennial, rarely flowering the first year .....

5
- 5(4).

Leaves mainly basal, entire or rarely some of them toothed or lobed .....

*G. parryi*
- Leaves cauline, toothed, lobed or entire .....

*G. spathulata*

*Gaillardia aristata* Pursh Blanketflower. Perennial herbs from a slender taproot; stems 20–80 cm tall, commonly foliose to middle or above, less commonly with basal leaves only; leaves 1.5–16 cm long, 3–25 mm wide, oblong to oblanceolate or elliptic, entire or toothed to pinnatifid, puberulent and sparingly long-villous with multicellular hairs; heads solitary or few, long peduncled; disk mainly 2–2.5 cm wide, purple; involucre bracts (and/or peduncle apex) commonly long-villous basally, green or suffused with purple, attenuate; rays 6–16, yellow, often purplish at the base, the lobes 5–12 mm long; setae of receptacle well developed; disk corollas densely woolly-villous, the hairs with reddish purple cross-walls, often obscuring the attenuate lobes; pappus of slender lance-attenuate scales, the caudate apex entire; achenes ca 1.5 mm long, rufous-pilose. Pinjun-juniper, ponderosa pine, aspen, lodge

pole pine, and spruce-fir communities at 2135 to 2870 m in Daggett and Uintah counties; British Columbia to Saskatchewan, south to Oregon, Colorado, and South Dakota; 9 (ii). A specimen by Neese (5711 BRY) is only sparingly villous on the basal portion of the bracts. The species is known from cultivation in Utah and Emery counties; 3 (0).

*Gaillardia flava* Rydb. Perennial herbs from a subrhizomatous woody caudex; stems 20–50 cm tall, foliose to the middle or above; leaves 2–5 cm long, 4–25 mm wide, pinnately incised, minutely puberulent and glandular-punctate; heads solitary, on peduncles to 25 cm long; disk 17–32 mm wide, yellow; involucre bracts sparingly to moderately villous, green, caudate-attenuate; rays 8–12, yellow, the lobes 3–5 mm long; setae of receptacle well developed, coarse and spinose; disk corollas sparingly villous, the hairs with colorless cross-walls, the lobes

acute; pappus scales oblong to oblanceolate, abruptly contracted to a barbellate appendage; achenes ca 1–1.5 mm long, yellowish pilose. Stream terraces and valley bottoms, commonly in cottonwood, willow, and tamarix communities at 1280 to 1650 m in Emery (type from Lower Crossing) and Grand counties; endemic; 6 (v). The plants are extremely resinous glandular, with a very bitter-flavored exudate.

*Gaillardia parryi* Greene [*G. acaulis* Gray]. Perennial herbs from a woody caudex; stems 10–35 cm tall; foliose basally, less commonly with some leaves cauline; leaves 2.5–9 cm long, 8–25 mm wide, petiolate, the blades ovate to elliptic, sparingly puberulent, minutely glandular-punctate, entire or irregularly lobed, obtuse; heads solitary on scapose peduncles; disks 17–32 mm wide, yellow; involucre bracts sparingly villous, green, attenuate; rays ca 8–12, yellow, the lobes 3–5 mm long; setae of receptacle copious, surpassing achenes; disk corollas sparingly villous, hairs with translucent cross-walls, the lobes acutish; pappus scales lanceolate, rather abruptly contracted to a smooth bristle; achenes ca 1.5 mm long, yellowish pilose. Pinyon-juniper and ponderosa pine communities, often in disturbed sites, at 1525 to 1830 m in Garfield, Kane, and Washington counties; northern Arizona; 7 (i).

*Gaillardia pinnatifida* Torr. [*G. mearnsii* Rydb.; *G. crassifolia* Nels. & Macbr., type from LaVerkin; *G. gracilis* A. Nels., type from Diamond Valley; and *G. straminea* A. Nels., type from LaVerkin]. Perennial (less commonly biennial or annual) herbs, the caudex seldom well developed; stems 8–55 cm tall, foliose to the middle, less commonly all leaves basal; leaves 1–7.5 cm long, 2–15 mm wide, petiolate; blades elliptic to oblanceolate or linear-oblong, puberulent and minutely glandular-punctate, pinnatifid to entire, acute to obtuse; heads solitary, on long peduncles; disks 15–35 mm wide, purple; involucre bracts moderately to sparingly villous, green or suffused purplish, caudate-attenuate; rays 7–12, yellow, the lobes 2–5 mm long; setae of receptacle spinescent; disk corollas sparingly villous, hairs with translucent or reddish cross-walls, the lobes acute; pappus scales oblanceolate, abruptly contracted to a scabrous awn; achenes ca 2 mm

long, white-pilose. Blackbrush, shadscale, ephedra-vanclevea, and pinyon-juniper communities at 915 to 1830 m in Carbon, Emery, Garfield, Grand, Kane, San Juan, Washington, and Wayne counties; Colorado and Arizona to Texas and Mexico; 75 (ix).

*Gaillardia spathulata* Gray Perennial herbs from a taproot and caudex; stems 6–35 cm tall, commonly foliose to middle or above; leaves 1–7.5 cm long, 0.4–2.3 cm wide, petiolate to sessile; blades oblanceolate to elliptic or ovate to oval, sparingly villous and glandular-punctate, entire or variously toothed or lobed, obtuse; heads solitary or few, on long peduncles; disks 18–33 mm wide, yellow; involucre bracts moderately to densely villous-pilose, green, lance-attenuate; rays 7–10, yellow, the lobes 2–4 mm long; setae of receptacle short, spinescent; disk corollas shortly villous on the obtuse lobes, the hairs with colorless cross-walls; pappus scales oblong-lanceolate, abruptly contracted to a scabrous awn; achenes ca 3.5 mm long, yellowish pilose. Salt desert shrub and shrub-grass communities at 1220 to 2320 m in Carbon, Emery, Garfield, Grand, and Wayne counties; endemic; 58 (xi).

#### GERAEA T. & G.

Annual herbs; leaves alternate; heads radiate, showy, solitary or few in a corymbose panicle; involucre hemispheric, 2- or 3-seriate; bracts white-ciliate; receptacle convex, the bracts clasping the achenes; rays neuter, yellow; pappus of two awns, connected by a low whitish crown; disk achenes flat, cuculate, villous-ciliate, black.

*Geraea canescens* T. & G. Desert Sunflower. Annual herbs; stems 2–6 dm tall, simple or branched, white-hirsute, glandular; leaves 1–7 cm long, 0.8–4 cm wide, lanceolate to oblanceolate or ovate, acute to obtuse, entire or few toothed, reduced upward; heads showy, borne on slender, often bracteate peduncles; involucre 10–25 mm wide, 7–12 mm high; bracts green, strongly ciliate, lance-acuminate; rays 10–21, yellow, 7–20 mm long; achenes 6–7 mm long. Warm desert shrub communities at 700 to 900 m in Washington County; Nevada, Arizona, and California; 3 (0).



## GLYPTOPLEURA D.C. Eaton

Low annual herbs; leaves rosetiform, with a few-toothed, white, crustaceous margin; heads many, short peduncled, the flowers all raylike, white or pale yellowish (or drying pinkish); involucre of 7-12 scarious-

margined bracts subtended by a basal group of pinnatifid or toothed bractlets; pappus of capillary white bristles in several series, the outer falling separately; achenes oblong, 5-angled, each face with 2 rows of tubercles, abruptly beaked.

1. Ray flowers showy, long exserted, 1.5-2.5 cm long; plants of Washington County ..... *G. setulosa*
- Ray flowers inconspicuous, only shortly exserted, mainly less than 10 mm long; plants broadly distributed ..... *G. marginata*

***Glyptopleura marginata* D.C. Eaton** Depressed annual herbs; stems 0.5-4 cm long; leaves crowded on the short stems, mainly 0.5-4 cm long, pinnatifid, the margins white-crustose, extended into irregular white processes; involucre 10-13 mm high, urceolate; bracts green, the margins hyaline; bractlets with white, irregular, branched processes, crustose at the apex; rays mainly 4-7 mm long, withered and pinkish on drying; achenes 4-5 mm long, tan, sculptured. Desert shrub communities at 1240 to 1590 m in Beaver, Box Elder, Iron, Piute, San Juan, Sevier, and Uintah counties; Oregon and Nevada; 9 (i).

***Glyptopleura setulosa* Gray** Low annual herbs; stems 1.5-6 cm long; leaves crowded on the short stems, mainly 0.3-5 cm long, pinnately lobed, the margins white-crustose into teeth; involucre 10-13 mm high, urceolate; bracts green or purplish tipped, the bracts with expanded apices bearing simple

or coalescent processes; rays mainly 1.5-2.5 cm long, pale yellowish, showy; achenes 4-5 mm long, tan, sculptured. Larrea, blackbrush, and Joshua tree communities at 700 to 915 m in Washington County; Arizona, Nevada, and California; 6 (0).

## GNAPHALIUM L.

Annual or perennial tomentose herbs; leaves alternate, entire; heads discoid, the flowers white, yellowish, or suffused with pink, borne in spikes, corymbs, or panicles; involucre campanulate to ovoid; bracts imbricate, scarious apically (at least); receptacle naked; outer flowers numerous, slender and pistillate, the few inner ones broader and perfect; style branches of inner flowers flattened, truncate, the stigmatic portion not sharply differentiated; anthers caudate; pappus of capillary bristles; achenes small, nerveless.

1. Heads large, mostly 4-7 mm high; clusters of heads not or rarely surpassed by leafy bracts; plants often over 20 cm tall ..... 2
- Heads small, the involucre 2-4 mm long; clusters of heads commonly surpassed or equaled by leafy bracts; plants mainly 4-20 cm tall ..... 3
- 2(1). Leaves strongly decurrent; bracts of involucre yellowish or fading yellowish ..... *G. chilense*
- Leaves not strongly decurrent; bracts of involucre pearly white ..... *G. wrightii*
- 3(1). Leaves spatulate to oblong, mainly 3-8 mm wide; plants loosely tomentose ..... *G. palustre*
- Leaves linear to narrowly oblanceolate, mainly 1-3 mm wide; plants rather closely tomentose ..... 4
- 4(3). Leafy bracts commonly less than 1.5 cm long, more loosely tomentose than the following ..... *G. exilifolium*
- Leafy bracts commonly more than 1.5 cm long, the tomentum appressed ..... *G. uliginosum*

*Gnaphalium chilense* Spreng. Annual or biennial herbs, the tomentose stems 15–40 cm tall or more; leaves 1.5–7 cm long, 2–8 mm wide, oblong to linear or the lowermost oblanceolate, decurrent, tomentose, reduced upward; heads numerous, in capitate clusters at stem apices; involucre 4–7 mm high, the bracts yellowish, tomentose only at the base. Disturbed, often moist sites at 1370 to 1770 m in Daggett, Duchesne, Kane, Salt Lake, and Utah counties; British Columbia to Montana, south to California, Arizona, and Texas; 5 (0).

*Gnaphalium exilifolium* A. Nels. [*G. grayi* Nels. & Macbr.]. Annual herbs; stems 8–25 cm tall, simple or branching from the base, tomentum appressed or somewhat loose; leaves 0.4–4 cm long, 1–3 mm wide, linear to linear-oblanceolate; heads clustered, in capitate cymes or spicate, subtended by leafy bracts that surpass them; involucre ca 3 mm high; bracts with hyaline brownish tips, tomentose at the base. Sedge-grass community, known in Utah from Wasatch (Lewis sn 1975 BRY) and Washington (Albee 2936b BRY); Colorado, New Mexico, and Arizona; 2 (0). This plant simulates *G. uliginosum*, with which it has been synonymized by some workers. More material is necessary to provide a definitive solution as to its proper taxonomic position.

*Gnaphalium palustre* Nutt. Annual herbs; stems 3–20 (30) cm tall, simple or more commonly much branched, loosely tomentose; leaves 1–3.5 cm long, 2–6 (10) mm wide, oblong to oblanceolate; heads clustered in capitate terminal or axillary cymes, subtended by leafy bracts that equal or surpass them; involucre 3–4 mm high; bracts brown, usually with whitish tips, tomentose below. Tamarix-willow, mountain brush, ponderosa pine, Douglas-fir, and sedge-grass communities, often on sand bars, lake shores, and pond mar-

gins, at 1370 to 2600 m in Cache, Garfield, Iron, Juab, Millard, Piute, Salt Lake, Sanpete, Sevier, Tooele, Uintah, Utah, Washington, and Wayne counties; British Columbia and Alberta, south to California and New Mexico; 31 (iii).

*Gnaphalium uliginosum* L. Annual herbs; stems 3–15 (25) cm tall, simple or more commonly much branched, closely tomentose; leaves 1–5 cm long, 1–3 mm wide, linear to linear-oblanceolate; heads clustered in capitate terminal or axillary cymes, subtended by leafy bracts that much surpass them; involucre 3–4 mm high; bracts brown with pale tips, tomentose below. Lake and pond margins and other disturbed sites at 2410 to 2830 m in Garfield and Sevier counties; 4 (0).

*Gnaphalium wrightii* Gray Perennial herbs; stems 3–8 dm tall, branched in the inflorescence; leaves 1.5–7 cm long, lance-linear, the lower ones spatulate; panicle open, with capitate clusters of heads not subtended or surpassed by bracteate leaves; involucre 5–6 mm high; bracts pearly white, tomentose below. Ponderosa pine and live oak communities at 1585 to 1830 m in Washington County; California to Texas, south to Mexico; 3 (0).

GRINDELIA Willd.

Annual, biennial, or perennial herbs, sometimes woody at the base; leaves alternate, simple, more or less resinous-punctate, usually sessile, often clasping; heads radiate or discoid, the rays 10–45, pistillate, fertile, yellow; involucre imbricate, more or less resinous; bracts thickish, with pale appressed base and often squarrose or revolute herbaceous tips; receptacle naked, flattish; disk flowers fertile, yellow; style branches with slender hispidulous appendages; pappus of 2–8 stiff, often curved, deciduous awns; achenes compressed to angular, glabrous.

1.	Heads discoid .....	2
—	Heads radiate .....	3
2(1).	Plants perennial; involucre bracts much thickened apically .....	<i>G. fastigiata</i>
—	Plants annual or biennial; involucre bracts only somewhat thickened .....	<i>G. aphanactis</i>

- 3(1). Involucral bracts, at least middle and upper ones, with appressed or erect tips, these not revolute or thickened ..... *G. laciniata*  
 — Involucral bracts spreading or recurved apically, often thickened apically ..... 4
- 4(3). Rays mostly 12–25, rarely more; leaves entire or sharply toothed, not callous-serrulate; achenes usually with one or more knobs on the apical margin; plants perennial ..... *G. nana*  
 — Rays mostly 25–40, rarely fewer; leaves regularly callous-serrulate to sharply toothed or entire; achenes mainly lacking apical knobs; plants biennial or perennial ..... *G. squarrosa*

***Grindelia aphanactis* Rydb.** Biennial herbs; stems 1.5–9 dm tall, uniformly leafy, glabrous; leaves mainly 2.5–7 cm long, 2–12 mm wide, oblong or oblanceolate, entire, crenulate-serrate or denticulate to pinnatifid, glabrous, the margin scabridulous; heads discoid, campanulate; involucre 7–20 mm high, 10–28 mm wide, resinous, mostly in 5 or 6 series, the upper portion loosely to moderately reflexed, glabrous; pappus awns 2 or 3; achenes 2.3–3 mm long, brown, mainly truncate apically. Weedy species of disturbed sites in Kane and San Juan counties; Colorado, Arizona, and Texas; 1 (0).

***Grindelia fastigiata* Greene** Perennial herbs; stems 5–10 dm tall or taller, glabrous; leaves mainly 1.5–13 cm long, 10–18 mm wide, oblanceolate to lance-oblong, entire or denticulate to dentate or serrate, glabrous; heads discoid; involucre campanulate, 10–14 mm high, 9–17 mm broad; bracts in ca 6 series, only the upper third or fourth spreading, with revolute, thickened tips; pappus awns 2 or 3; achenes oblong, 3.5–5 mm long. Sandy terraces and washes at 1125 to 1375 m in Emery, Grand, and San Juan counties; Colorado; 9 (iv); a Plateau endemic.

***Grindelia laciniata* Rydb.** Perennial herbs; stems 2.5–4.5 dm tall, glabrous; leaves mainly 2–6 cm long, 3–1.5 mm broad, pinnatifid or the upper subentire or entire, narrowly oblanceolate to oblanceolate, glabrous; heads

radiate; involucre 7–10 mm high and wide; bracts with upper one-third to one-half spreading, glabrous; pappus awns 3–5; achenes 2.5–3.5 mm long. Sandy washes in San Juan County (type from San Juan County); Arizona; 1 (0).

***Grindelia nana* Nutt.** Low Gumweed. [*G. brownii* Heller; *G. nana* f. *brownii* (Heller) Steyermark]. Perennial herbs; stems 0.8–6.5 (8) dm tall, glabrous; leaves mainly 1.5–10 cm long, 5–30 mm wide, oblanceolate, scarcely clasping; heads radiate; involucre campanulate; bracts in 5–7 series, reflexed or revolute in the upper third to fifth; rays 11–28, yellow, 5–11 mm long; pappus awns 2; achenes 3.5–4 mm long. Ruderal weed at ca 1585 to 1650 m in Cache County; Washington to Montana, south to California and Idaho; 4 (0).

***Grindelia squarrosa* (Pursh) Dunal** Curly Gumweed. [*Donia squarrosa* Pursh; *G. squarrosa* f. *depressa* Steyermark, type from Salt Lake County]. Perennial or biennial herbs; stems 1–8 (10) dm tall, glabrous; leaves mostly 2–5 cm long, oblong, regularly callous toothed, sometimes sharply toothed or entire, the upper clasping; heads radiate, strongly resinous; bracts with the green tips strongly rolled back; rays 25–40, yellow, 7–15 mm long; pappus awns 2 or 3 (to 6); achenes 2.3–3 mm long. Two more or less distinctive varieties are present in Utah.

1. Main upper cauline leaves 2–4 times longer than broad, oblong-ovate to oblong ..... *G. squarrosa* var. *squarrosa*  
 — Main upper cauline leaves 5–8 times longer than broad, narrowly oblong to oblanceolate ..... *G. squarrosa* var. *serrulata*

**Var. *serrulata* (Rydb.) Steyermark** [*G. serrulata* Rydb.]. Salt desert shrub, sagebrush, saline meadow, and mountain brush communities at 1310 to 1420 m in all Utah counties;

Wyoming south to New Mexico and Arizona, and introduced widely elsewhere; 72 (vii).

**Var. *squarrosa*** [*G. serrulata* f. *depressa* Steyermark, type from west of Salt Lake



City]. Waste places at 1300 to 2135 m in Duchesne, Juab, Salt Lake, Utah, and Wasatch counties; widespread mainly to the east of our area; 6 (0).

GUTIERREZIA Lag.

Perennial shrubs or subshrubs, glutinous, glabrous or hirtellous; leaves alternate, linear, often punctate; heads radiate, small, numerous; rays pistillate or neutral, yellow, or lacking; involucre cylindric to turbinate, the bracts imbricate, chartaceous; receptacles

1. Heads cylindric, the ray and disk flowers 1 or 2 each ..... *G. microcephala*
- Heads turbinate, with more than 4 flowers ..... 2
- 2(1). Ray and disk flowers 3–8 each; involucre 2–3 mm thick; heads often clustered at ends of branches; plants widespread ..... *G. sarothrae*
- Ray flowers 4–10, disk flowers 5–23; involucre 2–7 (9) mm thick; heads solitary or in pairs at branch ends; plants of restricted distribution ..... 3
- 3(2). Disk flowers 5–12, 3.5–4.5 mm long; ray flowers 2–5 mm long; plants of Uintah County ..... *G. pomariensis*
- Disk flowers 15–23, ca 3 mm long; ray flowers 5–7 (10) mm long; plants of eastern Millard County ..... *G. petradoria*

*Gutierrezia microcephala* (DC.) Gray Thread Snakeweed. [*Brachyris microcephala* DC.; *G. sarothrae* var. *microcephala* (DC.) Benson; *Xanthocephalum microcephalum* (DC.) Shinnery]. Rounded shrub, 30–100 cm tall; stems slender, grayish to straw colored or green above, from a woody crown; leaves dimorphic, the cauline 2–5 cm long, 2–4 mm wide, linear or linear-lanceolate, and with shorter, narrower fasciculate axillary ones, often one or both lacking at anthesis; heads clustered at branch ends, sessile; involucre 3–4 mm long, 1–1.5 mm wide, cylindric; bracts fewer than 10, lanceolate, the tip greenish, slightly thickened; ray flowers 1 or 2, 3–4 mm long; disk flowers 1–3, 2–3 mm long; pappus of ca 8 scales; achenes of disk flowers abortive, those of ray flowers fertile, 2–3 mm long, hairy. Blackbrush, vanceleavephedra, saltbush, purple sage, rabbitbrush, and pinyon-juniper communities at 850 to 1830 m in Emery, Garfield, Grand, Juab, Kane, Millard, San Juan, Utah, Washington, and Wayne counties; Nevada and California to Colorado, south to Texas and Mexico; 27 (viii).

*Gutierrezia petradoria* (Welsh & Goodrich) Welsh comb. nov. [based on: *Xantho-*

naked or bristly, convex; disk flowers few to many, yellow, perfect or sterile; pappus of 10–12 unequal scales; achenes obovoid or oblong, pubescent.

LANE, M. 1982. Generic limits of *Xanthocephalum*, *Gutierrezia*, *Amphiachris*, *Gymnosperma*, *Greenella*, and *Thurovia* (Compositae: Asteraceae). Systematic Botany 7: 405–417.

SOLBRIG, O. T. 1960. Cytotaxonomic and evolutionary studies in the North American species of *Gutierrezia* (Compositae). Contr. Gray Herb. 188: 1–63.

*cephalum petradoria* Welsh & Goodrich Brittonia 33: 301. 1981]. Goldenrod Snakeweed. Perennial, suffrutescent; stems herbaceous except at the base, hirtellous, simple below the inflorescence, loosely caespitose, from a stout taproot and branching, mostly underground, woody caudex; leaves arranged singly along the stems, linear, 0.5–4.5 cm long, 1–3 (4) mm wide, reduced upward, secondary fascicled leaves in some lower axils; heads solitary or in pairs on bracteate peduncles, or some almost sessile; involucre 5–9 mm high, 3–7 mm wide (to 9 when pressed), campanulate, the bracts ca 20, in 3 (4) series, greenish, the tips thickened; ray flowers 4–10, 5–10 mm long, 1–4 mm wide, when fresh; disk flowers 15–23, ca 3 mm long; pappus scales ca 10–12; achenes 3–4 mm long, pubescent, abortive in disk flowers. Sagebrush, oakbrush, mountain mahogany, and white fir communities at 1920 to 2590 m in eastern Millard County (Canyon and Pavant ranges); type from the Canyon Mountains; endemic; 9 (0).

*Gutierrezia pomariensis* (Welsh) Welsh comb. nov. [based on: *Gutierrezia sarothrae* var. *pomariensis* Welsh Great Basin Nat. 30: 19. 1970; *Xanthocephalum sarothrae* var.

*pomariense* (Welsh) Welsh]. Orchard Snake-weed. Rounded subshrubs; stems 1.2–4.5 dm tall, several to many from a persistent woody base; leaves 1.5–5.2 cm long, 0.5–2.5 mm wide, linear, entire, glabrous or scabrous, glandular-punctate; heads in corymbose inflorescences, solitary or 2 or 3 clustered at stem ends; involucre 5–7.5 mm high, 2–5 mm broad, turbinate to cylindric; bracts broadly obtuse, with a greenish subapical spot, resin coated; ray flowers 5–9, the corollas 2–5 mm long; disk flowers 5–12, the corollas 3.5–4.5 mm long; pappus scales ca 5–8; achenes 1–2 mm long, hairy. Mixed desert shrub community at 1460 to 2135 m in Duchesne and Uintah (type from Dinosaur National Monument) counties; endemic; 17 (iv).

*Gutierrezia sarothrae* (Pursh) Britt. & Rusby Broom Snakeweed. [*Solidago sarothrae* Pursh; *Xanthocephalum sarothrae* (Pursh) Shinners]. Rounded shrubs; stems 9–90 cm tall, profusely branched from the base, otherwise in the inflorescence, from a woody caudex and stout taproot; leaves dimorphic, the main cauline ones 2–7 cm long, 1–3 mm wide, linear to linear-lanceolate, the fascicled secondary ones in lower axils, entire, glabrous to tomentulose; heads in corymbose inflorescences, usually in clusters of 3–10 at branchlet ends, seldom solitary; involucre

3–4.5 mm high, 2–3.5 mm wide, turbinate; bracts narrow, acute, with green thickened tip; ray flowers 3–7, yellow, 2–5 mm long; disk flowers mostly 3–8, 2–3 mm long; pappus of 8–10 scales; achenes 1–2 mm long, hairy. Warm desert shrub, sand sagebrush, live oak, sagebrush, rabbitbrush, mountain brush, and pinyon-juniper communities, often in disturbed sites, at 760 to 2440 m in probably all Utah counties; British Columbia east to Saskatchewan and south to Mexico. Our variable material adjusts to disturbances and increases on grazed native rangelands; it is not considered to be palatable; 208 (xlv).

HAPLOPAPPUS Cassini

Annual or perennial herbs, subshrubs, or shrubs, usually resinous or glandular; leaves alternate, entire or toothed to lobed; heads discoid or radiate, usually small to large, variously clustered or solitary; involucre cylindric to turbinate or campanulate, the bracts imbricate, not aligned; receptacle flat to convex, naked; rays yellow when present; disk flowers perfect, yellow; pappus of barbellate capillary bristles; achenes angled or striate to smooth.

HALL, H. M. 1928. The genus *Haplopappus*. Carnegie Institution of Washington. 391 pp.

- 1. Plants low, rounded, branched shrubs, or tall slender shrubs or subshrubs ..... 2
- Plants annual or perennial herbs, branched or unbranched ..... 11
- 2(1). Heads borne on stems 2.5–5 dm long; plants of saline sandy drainages or sandstone outcrops in southern Utah ..... 3
- Heads borne on stems less than 2.5 dm long; plants of various substrates and distribution ..... 4
- 3(2). Plants definitely shrubby, the mature branchlets ashy gray or white, of sandstone outcrops and canyons ..... *H. scopulorum*
- Plants shrubby only at the base, the branchlets straw colored to greenish; plants of saline drainage bottoms and terraces ..... *H. drummondii*
- 4(2). Stems of the season white-tomentose; involucre 10–13 mm long, the bracts only somewhat imbricate; plants commonly of high elevations ..... *H. macronema*
- Stems glabrous, glandular, or hairy, not tomentose; involucre mainly less than 10 mm long, but, if longer, otherwise differing ..... 5
- 5(4). Involucre campanulate, 8–12 mm long; heads showy, the rays 8–10 mm long; plants of lower elevations in Washington County ..... *H. linearifolius*
- Involucre turbinate to cylindric or campanulate, commonly less than 8 mm long; heads not especially showy, the rays mainly 2–5 mm long, or lacking ..... 6

- 6(5). Leaves densely glandular punctate, linear; ray flowers present; plants known from Washington County ..... *H. laricifolius*
- Leaves not glandular-punctate, narrowly to broadly oblanceolate or oblong; ray flowers lacking; plants more broadly or otherwise distributed ..... 7
- 7(6). Heads 12–22 mm high, the bracts subequal, the outer herbaceous and the inner chartaceous and with broad hyaline margins; plants of limestone outcrops in the Paunsagunt and Markagunt plateaus, or mainly of igneous outcrops in the Pine Valley Mountains ..... 8
- Heads 5.5–9.5 mm high, the bracts imbricate in several series, variously herbaceous or chartaceous, but seldom any with broad hyaline margins; plants of various substrates and distribution ..... 9
- 8(7). Involucral bracts 1-nerved; achenes evenly though sparingly hairy; plants of the Pine Valley Mountains, Washington County ..... *H. crispus*
- Involucral bracts 3-nerved; achenes glabrous except for a few hairs apically; plants of the Paunsagunt and Markagunt plateaus ..... *H. zionis*
- 9(7). Leaves densely stipitate-glandular, oblanceolate, acute, the margins not especially repand ..... *H. watsonii*
- Leaves lacking stipitate glands, narrowly oblanceolate to oblong, or, if oblanceolate, the margins repand-undulate ..... 10
- 10(9). Leaves oblanceolate, 2–5 mm wide ..... *H. cervinus*
- Leaves narrowly oblanceolate to oblong, 0.5–2 mm wide ..... *H. nanus*
- 11(1). Leaves strongly 3-nerved and veiny, thick and leathery; caudices thick, woody, branched ..... 12
- Leaves not 3-nerved and veiny; caudices simple, or, if branched, not woody ..... 13
- 12(11). Bracts obtuse to rounded or less commonly acutish, strongly imbricate; plants of the Colorado drainage system ..... *H. armerioides*
- Bracts acute to attenuate, subequal to strongly imbricate; plants widespread ....  
..... *H. acaulis*
- 13(11). Leaves with lobes or teeth spinulose tipped; involucral bracts spinulose tipped ..... 14
- Leaves entire or toothed, but then not spinulose tipped; involucral bracts not spinulose tipped ..... 15
- 14(13). Involucral bracts glabrous or glandular dorsally; leaves pinnatifid; plants perennial ..... *H. spinulosus*
- Involucral bracts strigose dorsally, also minutely ciliate; leaves lobed or merely toothed to entire; plants annual ..... *H. gracilis*
- 15(13). Stems mainly 20–40 cm tall, loosely tomentose above; involucre 15–30 mm wide; plants evidently rare ..... *H. croceus*
- Stems 5–20 cm tall, or, if taller, not or seldom loosely tomentose, or the heads smaller ..... 16
- 16(15). Heads racemosely or spicately arranged; stems erect or nearly so, not strongly bent at the base ..... *H. racemosus*
- Heads solitary or corymbosely (rarely racemosely) arranged; stems strongly bent at the base ..... 17
- 17(16). Involucres 12–15 mm high, 20–30 mm wide; plants not hairy in the leaf axils ...  
..... *H. clementis*
- Involucres 5–10 mm high, 10–20 mm wide, or, if larger, the plants with hair tufts in basal leaf axils ..... 18



- 18(16). Involucral bracts herbaceous throughout; achenes glabrous; plants rare, known only from the Tushar Mountains ..... *H. apargoides*  
 — Involucral bracts herbaceous only apically; achenes hairy; plants locally common in saline meadows ..... *H. lanceolatus*

***Haplopappus acaulis* (Nutt.) Gray** Stemless Goldenweed. [*Chrysopsis acaulis* Nutt.; *C. caespitosa* Nutt.]. Perennial caespitose herbs from a thick ligneous pluricipital caudex and stout taproot, the caudex branches clothed with brown to ashy marcescent leaf bases and leaves; herbage resinous, scabrous to glabrous; stems mainly 5–20 cm tall; basal leaves 0.3–6 cm long, 1.5–10 mm wide, rigid, narrowly to broadly oblanceolate, sharply mucronate, 1- to 3-nerved; cauline leaves few, developed or reduced upward; heads

solitary (rarely 2); involucre hemispheric, 6–10 mm high, 8–20 mm wide; bracts in 3 series, more or less mucronate; rays 6–15, 8–12 mm long, 2–4 mm wide; pappus white to brownish; achenes silky-villous or glabrous. This is a variable taxon, with several morphological phases. Despite the tendency for some of the variations to be correlated geographically, it seems best to regard our materials as consisting of two mainly sympatric varieties.

1. Cauline leaves well developed, often the main foliage leaves; herbage merely resinous-glandular; plants of the Great Basin ..... *H. acaulis* var. *glabratus*  
 — Cauline leaves usually much reduced, surpassed in size by the basal ones; herbage scaberulous or merely resinous-glandular; plants more widely distributed ..... *H. acaulis* var. *acaulis*

**Var. *acaulis*** Sagebrush-grass, pinyon-juniper, mountain brush, ponderosa pine, western bristlecone, and spruce-fir communities at 1430 to 2685 m in Beaver, Box Elder, Cache, Daggett, Emery, Garfield, Juab, Kane, Millard, Sanpete, Sevier, Summit, Tooele, Uintah, and Utah counties; Oregon to Wyoming, south to California, Nevada, and Colorado; 60 (ix). There is a narrow-leaved glabrous phase of this taxon in the southern portion of Duchesne County, mainly on Green River Shale. Possibly it deserves recognition at some taxonomic rank.

**Var. *glabratus*** D.C. Eaton [*Stenotus falcatus* Rydb., type from Iron County; *S. latifolius* A. Nels., type from Utah County]. Black sagebrush, wildrye, pinyon-juniper, mountain brush, and grass-shrub communities at 1525 to 2900 m in Beaver, Iron, Juab, Millard, Tooele, and Utah counties; Saskatchewan south and west to California and Nevada; 22 (iv).

***Haplopappus apargoides* Gray** Perennial shortly caulescent herbs, 3–8 (15) cm tall, from a taproot and simple or branched caudex, this clothed with brown marcescent leaf bases; basal leaves mainly 2–6 cm long, 2–6 mm wide, lanceolate to narrowly oblanceolate; cauline leaves reduced upward, sessile,

the margins scabrous or ciliate; herbage sparingly long-villous with multicellular hairs; heads solitary; involucre hemispheric, 8–12 mm high, 10–14 mm broad; bracts imbricate, lanceolate to oblong, acute, cuspidate, herbaceous almost or quite to the base, glabrous dorsally, the margins long-ciliate; ray flowers 15–40, yellow, 8–15 mm long; pappus tawny; achenes glabrous. Alpine tundra community at 3355 m in Piute County (Tushar Mountains); California and Nevada; 1 (i). The specimen examined (Welsh and Thorne 12982 BRY) is tentatively assigned to this species, which is known otherwise only from the eastern Sierra Nevada and adjacent Nevada.

***Haplopappus armerioides* (Nutt.) Gray** [*Stenotus armerioides* Nutt.]. Perennial caespitose herbs from a thick ligneous pluricipital caudex and stout taproot, the caudex branches clothed with brown to ashy marcescent leaf bases and leaves; herbage resinous-glandular, otherwise glabrous or with scabrous leaf margins; stems 0.5–20 cm tall; basal leaves 1.5–8 cm long, 1.5–10 mm wide, rigid, linear to oblanceolate, sharply mucronate; 1- to 3-nerved; cauline leaves few, reduced upward; heads solitary (rarely 2); involucre campanulate, 8–13 mm high, 10–18 mm wide; bracts in 3 or 4 series, imbricate,

oblong to oval or obovate, obtuse, sometimes lobed below the apex, greenish near the apex, glabrous; rays 8–12, 10–12 mm long, yellow, 3–5 mm wide; pappus white; achenes silky-

villous. This distinctive species is represented in Utah by two phases, which are more or less morphologically distinctive and geographically correlated.

1. Stems mainly 3–8 cm tall; leaves linear to linear-oblongate, mainly 1–3 mm wide; plants of the Green River Formation, Uintah County ..... *H. armerioides* var. *gramineus*
- Stems usually over 8 cm tall; leaves oblanceolate, mainly 3–10 mm wide; plants widespread ..... *H. armerioides* var. *armerioides*

**Var. *armerioides*** Blackbrush, black sagebrush, pigmy sagebrush, salt desert shrub, pinyon-juniper, mountain brush, and ponderosa pine communities at 1340 to 2120 m in Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Kane, San Juan, Sevier, and Uintah counties; Montana to Arizona, east to New Mexico and Nebraska; 85 (xii).

**Var. *gramineus*** Welsh & F. J. Smith Desert shrub and pinyon-juniper communities at ca 1585 to 1895 m in Duchesne and Uintah counties; endemic; 17 (0).

***Haplopappus cervinus*** Wats. Shrubs, 1–4 dm tall, much branched; branchlets grayish to straw colored; leaves 6–18 mm long, 2.2–6 mm wide, oblanceolate, straight or curved, entire or repand-undulate, attenuate basally, cuspidate apically, glabrous or resinous; heads few, cymose; peduncles 3–10 mm long; involucre 6.5–7.5 mm high, 5–8 mm wide; bracts imbricate in several series, the outer greenish ones narrowly acuminate with straight or spreading tips, the inner chartaceous ones narrowly oblong, acute or cuspidate, all glabrous but resinous; ray flowers 5–7, yellow, 2.5–4 mm long, ca 1 mm wide; disk flowers 5–11, glabrous or the tube sparingly puberulent; pappus tawny; achenes strigose. Black sagebrush, shadscale, pinyon-juniper, and mountain brush communities at 1670 to 2440 m in Millard and Sevier counties; Arizona; 5 (0). The type came from a place called Antelope Canyon (possibly in present-day western Millard County). More collections are needed.

***Haplopappus clementis*** (Rydb.) Blake [*Pyrrocoma clementis* Rydb.; *P. subcaesia* Greene, type from Panguitch Lake; *P. lappathifolia* Greene, type from "Utah"]. Perennial herbs from a simple caudex and stout taproot, the subrhizomatous caudex clothed

with brown, often shredded marcescent leaf bases; stems 10–30 (40) cm tall, decumbent-ascending from an abruptly curved base, villous; basal leaves mostly 2–15 cm long, 4–17 mm wide, oblanceolate, glabrous or sparingly puberulent, entire or dentate, tapering to a petiole, acute; cauline leaves reduced upward, sessile and somewhat clasping; heads solitary (rarely 2 or 3); involucre broadly hemispheric, 8–16 mm high, 18–30 mm wide; bracts in several series, oblong to lanceolate, green throughout or the base chartaceous, villous; ray flowers 30–60, yellow or golden, 8–14 mm long; pappus tawny; achenes hairy. Grass-sagebrush, spruce-fir, sedge-forb, and meadow communities at 2590 to 3390 m in Beaver, Daggett, Duchesne, Emery, Garfield, Iron, Kane, Piute, Sanpete, Summit, and Uintah counties; Wyoming to Colorado; 39 (vi). Specimens from Utah that have been determined as *H. integrifolius* Gray apparently fall here, including the type of *Pyrrocoma lappathifolia*, which was discussed by Hall (1920). Involucral bracts vary from herbaceous throughout to chartaceous at the base. More work is indicated.

***Haplopappus crispus*** L.C. Anderson Shrubs, much branched from the base, 3–5 dm tall (or more); branchlets covered with short-stalked glands; leaves 1.5–3 cm long, 3–8 mm wide, entire, green, spatulate to oblong-oblongate, acuminate, the margins undulate-crested, glutinous with low glands, not crowded below the inflorescence; heads 1 or 2, more commonly more, per branch, loosely paniculate to congested and cymose; involucre campanulate, the heads 12.5–16 mm long, 5–9 mm wide; bracts in several series, finely glandular, the outermost green, leaflike; rays lacking; disk flowers 14–24, pale yellow; pappus tawny; achenes 6.5–8.5

mm long, sparsely but evenly hairy. Ponderosa pine, fir, manzanita, and aspen communities at (915?) 2471 to 3050 m in Washington and Millard (?) counties; endemic; 8 (0).

***Haplopappus croceus* Rydb.** Perennial herbs, mainly 2–6 cm tall, from a simple caudex and stout taproot, the caudex clothed with fibrous marcescent leaf bases; basal leaves 8–20 cm long, 6–25 (40) mm wide, elliptic to oblanceolate, petiolate, entire or undulate, obtuse to acutish, glabrous or puberulent; cauline leaves reduced upward, sessile, more or less clasping; heads solitary (rarely more); involucre hemispheric, 12–18 mm high, 20–30 mm wide; bracts in several series, ovate to oblong or oblanceolate, herbaceous apically, chartaceous to leathery basally; ray flowers 25–70, burnt orange, 10–25 mm long; pappus brownish; achenes glabrous or pilose. Mountain brush community at ca 2470 m in San Juan (La Sal Mountains) and Washington (Kolob Reservoir) counties; Wyoming south to Arizona and New Mexico; 2 (0).

***Haplopappus drummondii* (T. & G.) Blake** [*Linosyris drummondii* T. & G.]. Perennial subshrub, the stems subherbaceous, arising from a woody base, 25–75 cm tall, straw colored to tan, longitudinally striate, glabrous; leaves 1.5–7.5 cm long, 1–16 mm wide, entire or irregularly lobed, linear to spatulate, glabrous, resinous; heads few to numerous, borne in corymbose cymes, peduncled; involucre turbinate, 6–8 mm high, 4–7.2 mm wide; bracts in 4 or 5 series, lance-oblong, coriaceous, with a thick green or brownish subapical spot, acute, resinous; ray flowers lacking; pappus tawny; achenes silky. Saline riparian areas in greasewood, saltgrass, rabbitbrush, saltbush, and tamarix communities at 1050 to 1800 m in Emery, Garfield, Grand, Kane, and San Juan counties; Colorado, Arizona, New Mexico, and Texas; 25 (vii).

***Haplopappus gracilis* (Nutt.) Gray** [*Dietia gracilis* Nutt.]. Annual herbs, 3–25 (30) cm tall, commonly branched from near the base; leaves 4–25 mm long, 1–3 mm wide, linear to narrowly spatulate, spinulose-dentate to pinnatifid, white-strigose, progressively reduced and entire upward; heads solitary or few to several and corymbosely arranged; involucre 6–8.5 mm high, 8–12 mm wide;

bracts in 5 or 6 series, linear-lanceolate, awn tipped, herbaceous medially, strigulose, not glandular; rays 15–30, yellow, 6–9 mm long; strigulose, not glandular; rays 15–30, yellow, 6–9 mm long; pappus tawny to white; achenes pilose. Larrea-gutierrezia, ponderosa pine, and spruce-fir communities at 850 to 960 m in Iron, Kane, and Washington counties; California to Colorado, south to Mexico; 10 (0).

***Haplopappus lanceolatus* (Hook.) T. & G.** [*Donia lanceolata* Hook.; *H. tenuicaulis* D.C. Eaton; *H. lanceolatus* var. *tenuicaulis* (D.C. Eaton) Gray; *Pyrocoma subviscosa* Greene; *H. lanceolatus* ssp. *subviscosus* (Greene) Hall; *Donia uniflora* Hook.; *H. uniflorus* (Hook.) T. & G.]. Perennial herbs from a simple caudex and stout taproot, the caudex clothed with brown to ashy marcescent, often fibrous, leaf bases; stems decumbent-ascending, abruptly bent at the base, 5–68 cm long; basal leaves 3–16 cm long, 3–35 mm wide, elliptic-oblong or lanceolate, glabrous or tomentose, petiolate, entire or dentate to lobed, often densely tomentose in the axils; cauline leaves reduced upward, finally sessile and clasping; heads solitary or few to several, and subcorymbose or less commonly racemose; involucre hemispheric, 5–12 mm high, 10–18 mm wide; bracts imbricate in 3 or 4 series, with green tips, glabrous or tomentulose; ray flowers 10–45, yellow, 5–10 mm long; pappus tawny; achenes densely hairy. Saline meadows at 1300 to 2500 m in Beaver, Cache, Carbon, Duchesne, Emery, Garfield, Iron, Juab, Millard, Piute, Rich, Salt Lake, Sevier, Tooele, and Utah counties; Oregon to Saskatchewan, south to California, Nevada, Colorado, and Nebraska; 42 (xi). This is a highly variable taxon of saline meadows through much of our area. Heads vary from solitary to numerous, from solitary to corymbosely or racemosely arranged. Vesture is lacking or tomentose, or rarely glandular. Recognition of taxonomic categories within the variation appears to be only arbitrarily possible, and it seems best to treat our specimens conservatively.

***Haplopappus laricifolius* Gray** Rounded shrubs 3–8 dm tall; branchlets resinous, yellowish, becoming gray in age; leaves 5–18 mm long, 1–1.5 mm wide, thick, linear, resinous-punctate; heads few to several in compact cymes, shortly pedunculate; involucre



campanulate, 3–5 mm high, 3–6 mm wide; bracts imbricate in ca 3 series, narrowly oblong, acute, yellowish or hyaline, glabrous or puberulent-ciliate; ray flowers 3–6, yellow, 4–5 mm long; disk flowers 9–16, glabrous or minutely pubescent; pappus tawny; achenes white hairy. Saltgrass seep margin in warm desert shrub at 1220 m in Washington County; Arizona to Texas and Mexico; 2 (ii).

*Haplopappus linearifolius* Gray [*H. interior* Cov.; *H. linearifolius* ssp. *interior* (Cov.) Hall]. Shrubs, mainly 4–10 (12) dm tall; branchlets yellowish, resinous, becoming gray in age; leaves 6–28 mm long, 1–2.5 mm wide, thickish, linear to narrowly oblanceolate, resinous-punctate; heads few to many, solitary on naked peduncles mainly 2–7 cm long; involucre hemispheric, 8–10 mm high, 10–18 mm wide; bracts biseriate, lance-linear, acute or acuminate, herbaceous medially, sometimes minutely glandular; rays 12–18, yellow, 9–15 mm long, 4–5 mm wide; disk flowers numerous; pappus white; achenes densely hairy. Joshua tree, creosote bush, blackbrush, juniper, live oak, and sagebrush communities at 700 to 1375 m in Washington County; California, Nevada, Arizona, and Baja California; 30 (ii). Our material is assignable to var. *interior* (Cov.) Jones.

*Haplopappus macronema* Gray [*Macronema discoideum* Nutt.]. Shrubs, mainly 1–5 dm tall; branchlets white-tomentose; leaves 8–32 mm long, 2–7 mm wide, oblanceolate to oblong, entire or more commonly undulate-crested, acute to obtuse, mucronate, glandular-scabrous; heads solitary or 2 to several; involucre campanulate, 9–13 mm high, 6–12 mm wide; bracts subequal, the outer few herbaceous, oblong, the inner lance-acuminate, chartaceous, glandular-scabrous; ray flowers lacking; disk flowers 10–25; pappus tawny; achenes villous. Douglas fir, lodgepole pine, spruce-fir, and alpine tundra communities at 2135 to 3420 m in Beaver, Box Elder, Duchesne, Garfield, Iron, Juab, Piute, Salt Lake, Sanpete, Sevier, Tooele, Salt Lake, and Utah counties; Oregon to Wyoming, south to California, Nevada, and Colorado; 38 (vi).

*Haplopappus nanus* (Nutt.) D.C. Eaton [*Ericameria nana* Nutt.]. Compact shrubs, mainly 1–3 (5) dm tall; branchlets yellowish, resinous, becoming gray in age; leaves 3–18

mm long, 0.5–2 mm broad, narrowly oblanceolate to linear, entire, acute, resinous but not punctate; heads solitary or few to several in compact cymes, sessile or shortly pedunculate; involucre narrowly turbinate, 5.5–8.5 mm high, 3–7 mm wide; bracts imbricate in 4 or 5 series, the outer often greenish medially, the inner chartaceous, with hyaline margins, glabrous; rays 1–7, yellow, 2–3 mm long; disk flowers 4–10; pappus tawny; achenes villous or glabrous. Desert shrub, shrub-grass, and juniper or pinyon-juniper communities at 1310 to 2820 m in Beaver, Juab, Millard, Piute, Sevier, Tooele, and Washington counties; Oregon, California, Nevada, and Idaho; 18 (iii).

*Haplopappus racemosus* (Nutt.) Torr. [*Homopappus racemosus* Nutt.]. Perennial herbs, from a simple caudex and stout taproot, the caudex clothed with fibrous marcescent leaf bases; stems 20–60 (100) cm tall, erect, not abruptly bent at the base (in ours); basal leaves mainly 6–25 cm long, 5–30 mm wide, the blades elliptic to oblong or oblanceolate, petiolate, rigidly erect, entire or toothed, glabrous or puberulent; cauline leaves reduced, sessile, clasping; heads racemose, in panicles or spikes, shortly pedunculate; involucre 8–12 mm high, 4–18 mm wide; bracts in 3 or 4 series, with green tips and coriaceous bases, abruptly pointed apically; rays 10–35, yellow, 5–12 mm long; pappus tawny; achenes hairy or glabrous. Saline meadows at 1370 to 1470 m in Millard and Utah counties; Oregon to Idaho, south to California and Nevada; 2 (i). Utah lies at the eastern margin of the range of this species complex, in which Hall (1928) recognized nine subspecies. Our material is hardly representative of the variation within the assemblage of forms that lie to the west of this region. One of our specimens (Welsh et al. 14514 BRY) belongs to the spiciform narrow-headed var. *sessiliflorus* (Greene) Welsh stat. nov. (based on: *Pyrrocoma sessiliflora* Greene Leaflet Bot. Obs. & Crit. 2: 12. 1909), and the other is a paniculiform large-headed phase apparently nearest to var. *prionophyllus* (Greene) Welsh stat. nov. (based on *Pyrrocoma prionophylla* Greene Leaflet Bot. Obs. & Crit. 2: 12. 1909). Much more material is required to evaluate the nature of the specimens in Utah. Racemose phases of the closely

related *H. lanceolatus* (q.v.) have been mistaken for *H. racemosus*. The erect or suberect stems and stiffly erect leaves appear to be diagnostic for our specimens of *H. racemosus*.

***Haplopappus scopulorum* (Jones) Blake** [*Bigelovia menziesii* var. *scopulorum* Jones, type from Zion Canyon; *H. scopulorum* var. *hirtellus* Blake, type from Cedar Canyon]. Shrubs, mainly 3–10 dm tall; branchlets green to straw colored or white, glabrous; leaves 0.7–7.8 cm long, 1–8 mm wide, narrowly lanceolate to oblong, entire, 3-nerved, glabrous, the margins scabrous, attenuate to a spinulose apex; heads few to many, borne in loose to subcompact cymes, peduncled; involucre narrowly campanulate, 6.5–9.5 mm high, 3–5.5 mm wide; bracts in 5 or 6 series, oblong, chartaceous and pale, or the tips greenish or often brownish, rounded-obtuse, glabrous, not resin coated; ray flowers lacking; disk flowers 10–20; pappus white; achenes white-pilose. Pinyon-juniper, mountain brush, and ponderosa pine communities at 1370 to 1830 m in Iron, Kane, San Juan, and Washington counties; Arizona; 10 (vii).

***Haplopappus spinulosus* (Pursh) DC.** [*Amellus spinulosus* Pursh]. Perennial herbs from a ligneous caudex; stems mainly 12–50 (60) cm tall, branching above the base; leaves 0.5–6 cm long, 1–10 mm wide, pinnatifid to bipinnatifid or the upper ones entire, or merely toothed, spinulose; heads solitary, or few in corymbose clusters; involucre 5–8 mm high, 8–12 mm wide; bracts in 4–6 series, linear, awn-tipped, herbaceous medially, glandular, not strigulose; rays 15–50, yellow, 8–10 mm long; pappus brownish; achenes pilose. Desert shrub community at ca 1300 m in San Juan County (Atwood 7175 BRY); Alberta to Minnesota, south to California, Arizona, New Mexico, Texas, and Mexico; 1 (0).

***Haplopappus watsonii* Gray** Shrubs, 1–4 dm tall; herbage stipitate-glandular; branchlets yellowish, becoming whitish to straw colored or grayish in age; leaves 4–28 mm long, 3–10 mm wide, oblanceolate to obovate or spatulate, entire or undulate, abruptly cuspidate-acuminate apically; heads several to numerous (rarely some solitary) in loose cymes, the peduncles 1–7 mm long; involucre subcylindric to narrowly campanulate, 5.5–8 mm high, 3–76 mm wide; bracts in ca 5

series, the outer ones greenish, the inner chartaceous or greenish at the tips; rays 5–10, yellow, 4–6 mm long; disk flowers 5–15; pappus brownish; achenes hairy. Rock outcrops (limestone, sandstone, or quartzite) in desert shrub, pinyon-juniper, mountain brush, and ponderosa pine communities at 1310 to 3440 m in Beaver, Box Elder, Cache, Davis, Juab, Millard, Salt Lake, Summit, Tooele, and Weber counties; Nevada and Utah; 33 (ii). Our material belongs to one of a vicarious pair of infraspecific taxa within the Great Basin known as var. *rydbergii* (Blake) Welsh comb. nov. (based on: *H. rydbergii* Blake Contr. U.S. Natl. Herb. 25: 545. 1925, nom. nov. pro *Macronema obovatum* Rydb. Bull. Torrey Bot. Club. 27: 68. 1900, type from City Creek Canyon). The var. *rydbergii* differs in having fewer disk flowers (5–15 not 15–25). Other supposedly diagnostic features (i.e., the green outer involucre bracts) fail, being present to a greater or lesser degree in both phases. The type variety has not been discovered in Utah, but should be expected in the western border region.

***Haplopappus zionis* L.C. Anderson** Shrubs, mainly 1–3 dm tall; herbage minutely and shortly stipitate-glandular; leaves 0.8–3.5 (4) cm long, 2–4.5 (7) mm wide, oblong to narrowly oblanceolate, 1-nerved, entire, abruptly mucronate; heads solitary or 2 or 3, in cymose clusters, peduncled; involucre cylindric-campanulate, 12–15 mm high, 6–12 mm wide; bracts subequal, herbaceous (outer) and greenish, the inner chartaceous or with a subapical green spot and broadly hyaline margins; rays lacking; disk flowers 8–21; pappus tawny; achenes glabrous below, strigose apically. Ponderosa pine and spruce-fir communities, commonly on limestone members of the Cedar Breaks (Wasatch) Formation, at 2440 to 3050 m in Garfield, Iron, and Kane counties; endemic; 5 (i).

#### HELENIIUM L.

Annual or perennial herbs; leaves alternate, glandular-punctate, decurrent or clasping; heads solitary or few to numerous in corymbose clusters, radiate, yellow; involucre bracts in 2 or 3 series, the bracts subequal or the inner shorter and narrower, herbaceous

or essentially so, soon deflexed; receptacle naked, convex or conic; rays pistillate or neuter; disk flowers numerous, perfect; pappus of 5–10 scarious or hyaline scales; achenes truncately obpyramidal, 4- or 5-angled, with as many intermediate ribs.

1. Leaves sessile, clasping; stems not winged; plants of aspen communities and upward ..... *H. hoopesii*
- Leaves decurrent; stems winged below the leaf bases; plants of riparian communities at lower elevations ..... *H. autumnale*

*Helenium autumnale* L. Common Sneezeweed. Perennial herbs; stems mainly 1.5–10 (12) dm tall, puberulent and glandular, corymbosely branched above; leaves 1.5–15 cm long, 3–35 (40) mm wide, serrate to entire, glandular-punctate; heads 3 to many, the disk hemispheric to subglobose, yellow, 1–2 cm wide; rays 10–20, yellow, mainly 8–12 mm long, soon reflexed; pappus scales lanceolate, with slender awn-tip as long as the body; achenes ca 1.5 mm long, hirsute and glandular. Cattail-willow, tamarix-grease-wood, and sedge-rush communities at 1220 to 1830 m in Box Elder, Daggett, Emery, Rich, Uintah, and Utah counties; British Columbia to Quebec, south to Arizona, and Florida; 18 (iii). This species is poisonous to livestock.

*Helenium hoopesii* Gray Orange Sneezeweed. [*Heleniastrum hoopesii* (Gray) Kuntze; *Dugaldia hoopesii* (Gray) Rydb.]. Perennial herbs, mainly 2–8 (10) dm tall, with a subrhizomatous caudex and fibrous roots; herbage more or less villous-tomentose to glabrate; basal leaves 2–30 cm long, 0.5–5 cm wide, oblanceolate, tapering to a clasping base; cauline leaves reduced upward, oblanceolate to elliptic or lanceolate, entire; heads 2–11, in loose corymbs; disks hemispheric, 2–3.5 cm wide; involucre 5–8 mm high, the

bracts lanceolate to elliptic; rays 13–21, yellow or yellow-orange, 15–35 mm long, finally reflexed; pappus scales hyaline, lanceolate, attenuate; achenes 3–4 mm long, hairy. Sagebrush, mountain brush, aspen, and spruce-fir communities, often in openings or riparian zones, at 1830 to 3200 m in Beaver, Box Elder, Carbon, Duchesne, Garfield, Iron, Juab, Piute, San Juan, Sevier, Summit, Utah, Wasatch, and Washington counties; Oregon to Wyoming, south to California, Arizona, and New Mexico; 69 (xiv). This is a poisonous plant, causing spewing sickness in sheep.

HELIANTHELLA T. & G.

Perennial herbs; leaves simple, opposite or alternate, entire; heads radiate, solitary or few to several in loose subcorymbose clusters; bracts imbricate to subequal, more or less herbaceous; receptacle plano-convex, chaffy throughout, the persistent bracts clasping the achenes; disk flowers numerous, fertile, yellow, or purple; rays yellow; pappus of 2 slender awns and short scales; achenes strongly compressed at right-angles to involucre bracts.

WEBER, W. A. 1952. The genus *Helianthella* (Compositae). Amer. Midl. Naturalist 48: 1–35.

1. Heads 3–12 or more, mainly less than 20 mm broad; rays 7–13 mm long, inconspicuous; disk flowers normally purple ..... *H. microcephala*
- Heads solitary or 2 or 3, mainly over 20 mm broad; rays 15–30 mm long, showy; disk flowers yellow ..... 2
- 2(1). Heads erect; involucre bracts lance-oblong, short-ciliate ..... *H. uniflora*
- Heads nodding; involucre bracts oblong-ovate, long-ciliate with multicellular hairs ..... *H. quinquenervis*

*Helianthella microcephala* (Gray) Gray [*Encelia microcephala* Gray]. Perennial herbs; stems 20–65 cm tall; herbage appressed hispidulous; basal leaves mainly 4–30 cm long, 0.5–3 cm wide, petiolate, the blades

elliptic to lanceolate, scabrous and harshly ciliate, acute to obtuse; cauline leaves reduced upward; heads 3–12 or more; bracts imbricate in ca 3 series, oblong to lanceolate or oblanceolate, strigose and roughly ciliate



and glandular; rays 8–10, yellow, 7–13 mm long; disk flowers commonly purple; achenes 7–8 mm long, long-pilose. Desert shrub, pinyon-juniper, ponderosa pine, mountain brush, and Douglas fir-limber pine communities at 1220 to 2745 m in Carbon, Duchesne, Emery, Garfield, Grand, Kane, San Juan, Sevier, and Uintah counties; Colorado and Arizona; 34 (x). In one plant from Navajo Mountain the disk flowers are apparently yellow. A single collection from west of Richfield (Welsh et al. 17487 BRV) is the only record examined for the Great Basin.

*Helianthella quinquenervis* (Hook.) Gray [*Helianthus quinquenervis* Hook.]. Perennial herbs; stems 5–15 dm tall, glabrous or villous above; basal leaves 0.3–40 cm long, 0.8–4 cm wide, petiolate, the blades elliptic to oblong or oblanceolate, entire, obtuse to acute; cauline leaves often enlarged to near stem middle then reduced, becoming subsessile or sessile, the largest (at least) prominently 5-nerved; heads nodding, solitary or 2 or 3; disk 2.5–4 cm wide; bracts ovate-lanceolate, acuminate, long-ciliate; rays 12–21, yellow, 15–35 mm long; achenes 8–10 mm long, pilose. Sagebrush, aspen, ponderosa pine, and spruce-fir communities at 2115 to 3175 m in Carbon, Daggett, Duchesne, Emery, Garfield, Grand, San Juan, Sevier, Summit, Uintah, and Wasatch counties; Oregon to South Dakota, south to Nevada, Arizona, and New Mexico; 13 (0).

*Helianthella uniflora* (Nutt.) T. & G. [*Helianthus uniflorus* Nutt.]. Perennial herbs from a branching caudex; stems mainly 3–10 dm tall, glabrous below or more or less spreading-hairy throughout; basal leaves 3–15 cm long, 0.6–5.5 cm wide, petiolate, the

blades oblanceolate to elliptic or lanceolate, entire, obtuse to acute; cauline leaves often enlarged to near stem middle, then reduced, becoming sessile or subsessile, the largest prominently 3-nerved; heads erect, solitary or 2 or 3; disk 1.5–3 cm wide; bracts lance-linear, acuminate or obtuse, scabrous-puberulent, shortly ciliate; rays 13–17, yellow, 2–4.5 cm long; achenes 6–7 mm long, pilose. Sagebrush, pinyon-juniper, mountain brush, ponderosa pine, aspen, and spruce-fir communities at 1525 to 3175 m in Beaver, Box Elder, Cache, Carbon, Davis, Duchesne, Garfield, Grand, Iron, Millard, Morgan, Piute, Rich, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, and Weber counties; Alberta to Montana, south to Nevada and Colorado; 64 (v).

HELIANTHUS L.

Annual or perennial herbs; leaves simple, opposite below, usually alternate above; heads radiate, showy, solitary or few in corymbs; involucre bracts imbricate or subequal, herbaceous; receptacle flat to convex, chaffy throughout, its bracts clasping the achenes; ray flowers conspicuous, yellow, neuter; disk flowers yellow or reddish, fertile; pappus usually of 2 main awns, scalelike at base, sometimes with additional scales present; achenes narrowly obovate in outline, 4-angled or obcompressed.

BLAUER, A. C. 1965. *Helianthus* (Compositae) in Utah. Proc. Utah Academy 42: 240–251.

HEISER, C. B. JR. 1947. Hybridization between sunflower species *Helianthus annuus* and *H. petiolaris*. Evolution 1: 249–262.

- 1. Plants perennial; disk flowers yellow; leaves mainly opposite, lanceolate to linear-lanceolate ..... *H. nuttallii*
- Plants annual; disk flowers reddish brown to purplish; leaves mainly alternate; leaves lanceolate to ovate ..... 2
- 2(1). Involucre bracts linear to narrowly lanceolate; pappus of numerous unequal scales ..... 3
- Involucre bracts lanceolate to ovate; pappus commonly of 2 distinct awns ..... 4
- 3(2). Involucre bracts surpassing the disk; pappus scales linear; stems moderately hirsute to glabrous; plants widespread ..... *H. anomalus*

- Involucral bracts subequal to the disk; pappus scales ovate; stems markedly hirsute; plants of Washington County ..... *H. deserticola*
- 4(3). Leaves canescent on both sides; involucral bracts narrowly lanceolate; plants of San Juan County ..... *H. niveus*
- Leaves hispid to strigose; involucral bracts lanceolate to ovate; plants wide-spread ..... 5
- 5(4). Involucral bracts ovate, rather abruptly narrowed to an acuminate tip, the central ones inconspicuously hairy; leaves often cordate and with serrate margins ..  
..... *H. annuus*
- Involucral bracts lanceolate, tapering to the tip, the central ones often white bearded apically; leaves seldom cordate, usually entire ..... *H. petiolaris*

***Helianthus annuus* L.** Common Sunflower. Annual herbs; stems commonly hispid and rough, 3–40 dm tall, simple or branched; leaves alternate above (3) 5–40 cm long, 2–40 cm wide, lance-ovate to broadly ovate, acute to obtuse, serrate, truncate or cordate (alternate) basally, hispid to hispidulous on both sides, petiolate; heads solitary or few; disks mainly 2–5 cm wide; involucral bracts lance-ovate to ovate, attenuate to caudate, hispid to hispidulous, ciliate; disk corolla lobes purplish red (rarely yellow); pappus of 2 awnlike ovate-lanceolate scales; achenes glabrous to strigose. Saltgrass-muhly grass, desert shrub, pinyon-juniper, and mountain brush communities, commonly where disturbed, at 1200 to 2440 m, probably in all Utah counties; widespread in the United States, Canada, Mexico, and elsewhere; 70 (xv). Our common weedy sunflower is assignable to ssp. *lenticularis* (Dougl.) Cockerell; the cultivated large-headed phase to var. *macrocarpus* (DC.) Cockerell.

***Helianthus anomalus* Blake** Sand Sunflower. Annual herbs; stems sparingly hispid to glabrate, 5–70 cm tall; leaves mainly alternate, petiolate, the blades 1.2–10 cm long, 0.4–4 cm wide, narrowly lanceolate to lance-ovate, yellowish green, acute, cuneate to obtuse basally, hispidulous to hispid on both sides; heads solitary or few, showy; disks mainly 12–24 mm wide; involucral bracts linear, commonly 10–25 mm long and 2–3 mm wide, hispid above, definitely hispid-ciliate, at least below, often some much surpassing the disk; disk corolla lobes purple; pappus of 2 large linear scales and numerous similar subequal scales; achenes 3.5–5.5 mm long, appressed pilose. Blackbrush, ephedra, purple-sage, vanceleeva, psorothamnus, and

pinyon-juniper communities, commonly in dunes or other sandy sites, at 1150 to 1830 m in Emery, Garfield, Grand, Juab, Kane, Millard, San Juan, Tooele, and Wayne (type from near Hanksville) counties; Arizona; 33 (xi). This is a Colorado Plateau endemic, with an extension onto dunes of the eastern Great Basin.

***Helianthus deserticola* Heiser** Desert Sunflower. Annual herbs; stems strongly hispid (at least below), 2–12 dm tall; leaves mainly alternate, petiolate, the blades 2–6 cm long, 0.5–2 cm wide, lanceolate to lance-ovate, green, acute, cuneate to obtuse basally, hispid to hispidulous on both sides; heads few to several (solitary), showy; disks 1.3–2.5 cm wide; involucral bracts linear, 8–14 mm long, 1.5–2.5 mm wide, hispid dorsally and ciliate, subequal to the disk; disk corolla lobes purple; pappus of 2 large lanceolate to lance-ovate scales and ca 10 smaller ones; achenes 4–5 mm long, pilose. Blackbrush, creosote bush, matchweed, and live oak communities at 850 to 1070 m in Washington County; Arizona and Nevada; 2 (0). This is an obscure taxon, despite the passage of two decades since its description; more specimens are required. Perhaps it is too nearly allied to *H. anomalus*, with which it shares some morphological features.

***Helianthus niveus* (Benth.) Brandege** Snowy Sunflower. [*Encelia nivea* Benth.]. Annual herbs; stems mainly 5–15 dm tall, canescent and hispid; leaves mainly alternate, petiolate, the blades 3–12 cm long, 0.9–6 cm wide or more, lanceolate to ovate, entire or serrate, mostly acute apically, canescent on both sides; heads solitary or few to many; disk 1–2.5 cm wide; bracts narrowly lanceolate, 1.5–2.5 mm wide, 8–12 mm long, subequal to the disk; disk corolla lobes purplish;

pappus of 2 lanceolate scales and several shorter scales. Sandy sites at ca 1375 m in San Juan Counties; Texas to California and Mexico; 1 (0). Our limited material is assignable to ssp. *canescens* (Gray) Heiser [*H. petiolaris* var. *canus* Britt.].

***Helianthus nuttallii* T. & G.** Nuttall Sunflower. [*H. bracteatus* E.E. Watson, type from Logan; *H. giganteus* var. *utahensis* D.C. Eaton, type from Wasatch Mountains; *H. utahensis* (D.C. Eaton) A. Nels.]. Perennial rhizomatous herbs with tuberous roots; stems 3–20 dm tall or more, glabrous or sparingly scabrous or hispid; leaves mainly opposite, shortly petiolate, the blades 4–16 cm long, 0.8–3 cm wide, narrowly lanceolate, acute to attenuate, entire or denticulate, cuneate basally, scabrous on both sides; heads solitary or few to many; disks mainly 12–28 mm wide; bracts lance-linear, 1.5–3 mm wide, subequal to, or surpassing, the disk, attenuate, appressed pubescent and more or less ciliate; disk corolla lobes yellow; pappus of 2 narrow awnlike scales; achenes 3–4 mm long, glabrous. Seeps, springs, wet meadows, and canal banks at 1280 to 2200 m in Cache, Carbon, Duchesne, Garfield, Juab, Rich, Salt Lake, Summit, Tooele, Uintah, Utah, Wasatch, Washington, and Weber counties; British Columbia to Saskatchewan, south to Nevada, Arizona, and New Mexico; 18 (0). **Note:** The perennial sunflower, *H. tuberosus* L., is grown for its edible roots in our area. It persists following cultivation and is difficult to eradicate. The leaves are broadly lanceolate to ovate.

***Helianthus petiolaris* Nutt.** Prairie Sunflower. Annual herbs; stems 0.5–12 dm tall, strigose to hispid or glabrous; leaves mainly alternate, petiolate, the blades 1–8 cm long, 4–25 (30) mm wide, lanceolate to ovate, acute to obtuse, entire or rarely serrate, cuneate to truncate basally, hispidulous to strigose; heads solitary or few; disk 10–25 mm wide; involucre bracts 2–5 mm wide, 7–15 mm long, lanceolate, acuminate or attenuate, hispidulous, usually short-ciliate; disk corolla lobes purplish; pappus of 2 lanceolate awnlike scales; achenes 3–4.5 mm long, hairy. Salt desert shrub, desert shrub, pinyon-juniper, and riparian communities, often where disturbed, at 1220 to 1920 m in Beaver, Duchesne, Emery, Garfield, Grand, Kane, Millard, San Juan, Sevier, Uintah, Wasatch, Washington, and Wayne counties; Alberta to Maine, south to California, Arizona, New Mexico, Texas, Louisiana, and South Carolina; 62 (xxii). Our material has been assigned to ssp. *fallax* Heiser. The material appears to be indigenous in the Colorado drainage system, but the rare specimens in the Great Basin seem to be adventive.

#### HELIOMERIS Nutt.

Annual or perennial herbs; leaves opposite (at least below), simple; heads radiate, solitary or cymose; involucre 2- or 3-seriate; rays yellow, neuter, pubescent dorsally; receptacles chaffy, the chaffy bracts clasping the achenes; disk flowers fertile; pappus none; achenes laterally compressed, 4-angled.

1. Plants perennial, widespread in montane habitats, less commonly in saline low elevation sites ..... *H. multiflora*
- Plants annual, restricted in low elevation saline habitats ..... 2
- 2(1). Plants subscapose, with long naked peduncles; leaves ovate to lanceolate . *H. soliceps*
- Plants caulescent, the peduncles bracteate or leafy; leaves linear ..... 3
- 3(2). Leaves canescent with appressed hairs; plants of southern Utah ..... *H. longifolia*
- Leaves hispidulous; plants of central and western Utah ..... *H. hispida*

***Heliomeris hispida* (Gray) Blake** Hair Goldeneye. [*H. multiflora* var. *hispida* Gray; *Gymnolomia hispida* var. *ciliata* Robins. & Greenm., type from Utah; *Viguiera ciliata* (Robins. & Greenm.) Blake]. Annual herbs;

stems simple or variously branched, 10–70 cm tall, hispidulous; leaves 0.6–9 cm long, 1–3 mm wide, linear, hispid and hispid-ciliate, acute; heads solitary or 2–5 or more; disks 7–15 mm wide, the corollas yellow; rays



ca 9–15, yellow, 6–13 mm long; involucre bracts 5.5–10 mm long, lance-attenuate, hispid and coarsely ciliate; pappus lacking; achenes ca 2.5 mm long, glabrous. Saline marshes and meadows at ca 1300 to 1470 m in Millard, Salt Lake, and Utah counties; Arizona, New Mexico, and Mexico; 9 (ii).

*Heliomeris longifolia* (Robins. & Greenm.) Cockerell [*Gymnolomia longifolia* Robins. & Greenm.; *Viguiera longifolia* (Robins. & Greenm.) Blake]. Annual herbs; stems simple or variously branched, 14–60 cm tall, strigose; leaves 1–6 cm long, 1.2–7.5 mm wide, linear to oblong, strigose, rarely hispid-ciliate near the bases, acute; heads solitary, or 2 to numerous; disks 7–10 mm wide, the corollas yellow; rays ca 8–10, yellow, 6–12 mm long; involucre bracts lance-acuminate to -attenuate, strigose, not especially ciliate; pappus lacking; achenes 2–2.5 mm long, brown, glabrous. Salt desert shrub and pinyon juniper communities at 1150 to 1525 m in Kane and Washington counties; Arizona to Texas and Mexico; 7 (iii). Our material is assignable to var. *annua* (Jones) Yates [*Gymnolomia multiflora* var. *annua* Jones, type from Utah?].

*Heliomeris multiflora* Nutt. Showy Goldeneye. [*Viguiera multiflora* (Nutt.) Blake]. Perennial herbs, from a woody taproot and pluricipital caudex; stems 2–10 (13) dm tall, strigose to scabrous-puberulent; leaves lanceolate to linear, mainly opposite, entire or serrate, 1–8 (10) cm long, 2–20 (25) mm wide, short-petiolate, plane or revolute, acute to obtuse; heads commonly 2 to several; disk 6–14 mm wide; involucre bracts linear or narrowly lanceolate, strigose; rays 10–14, yellow, 7–18 mm long; pappus lacking; achenes 1.2–1.8 mm long, brown, glabrous. Two weakly discernible varieties are included in our material.

1. Leaves commonly over 5 mm wide, plane; plants of mesic montane sites ..... *H. multiflora* var. *multiflora*
- Leaves commonly less than 5 mm wide, the margins revolute; plants of arid plains and mountains ..... *H. multiflora* var. *nevadensis*

Var. *multiflora* Sagebrush, juniper, cottonwood, pinyon-juniper, aspen, and spruce-fir communities, often in riparian sites, at 1340 to 2870 m in all Utah counties; Montana south to California, Arizona, and New Mexico; 137 (xvi).

Var. *nevadensis* (A. Nels.) Yates [*Gymnolomia nevadensis* A. Nels.]. Shadscale, mat-triplex, pinyon-juniper, and mountain brush communities at 1370 to 2135 m in Grand, Juab, Uintah, and Washington counties; Nevada; 13 (i).

*Heliomeris soliceps* (Barneby) Yates Tropic Goldeneye. [*Viguiera soliceps* Barneby]. Annual herbs, 10–41 cm tall; stems branched below, terminating in subscapose, merely bracteate peduncles that overtop the foliage; leaves opposite below, the blades 15–38 mm long, 6–20 mm wide, ovate to lanceolate, strigose, 3-nerved, petiolate, obtuse to cuneate, becoming smaller upwards; peduncles 7–28 cm long; involucre biseriate, the bracts lance-acuminate, acute, 5–6 mm long, strigose; rays 10–12, yellow, 10–15 mm long; pappus lacking; achenes 2.8–3.3 mm long, blackish. Mat-saltbush community on Tropic Shale Formation at 1400 to 1470 m in Kane County; endemic. This is a striking species, forming masses of yellow blossoms in years of adequate rainfall; 5 (ii).

HETEROTHECA Cass.

Annual, biennial, or perennial herbs; leaves alternate, simple, entire; heads radiate; involucre campanulate to hemispheric; bracts numerous, narrow, imbricated in several series; receptacle convex, naked; rays yellow, pistillate and fertile; pappus of capillary bristles; disk flowers numerous, the pappus present and usually double, the inner of capillary bristles, the outer (when present) of short scales or bristles; achenes hairy.

WAGENKNECHT, B. L. 1960. Revision of *Heterotheca*, Section *Heterotheca* (Compositae). *Rhodora* 62:61–76, 97–109.

1. Plants low, creeping, arising from subrhizomatous caudex branches; heads nodding, solitary or 2 or 3, known from sandy sites in Garfield, Kane, and Washington (?) counties ..... *H. jonesii*

- Plants various in habit, the caudex branches, if present, not rhizomatous; heads few to numerous, seldom nodding, distribution various ..... 2
- 2(1). Plants perennial, from a woody root crown, the stems numerous, forming rounded clumps, common ..... *H. villosa*
- Plants annual or biennial, the root crown herbaceous; stems solitary or few, not forming rounded clumps, rare ..... 3
- 3(2). Upper leaves cordate-clasping basally; involucre glandular-puberulent and canescent ..... *H. psammophila*
- Upper leaves tapering to a sessile base; involucre glandular, pubescent, not canescent ..... *H. grandiflora*

*Heterotheca grandiflora* Nutt. Telegraph Weed. Annual or biennial herbs; stems stout, branched above, 5–12 (20) dm tall, hirsute, glandular-pubescent; leaves 2–6 cm long, 0.8–2.5 cm wide (or more), ovate to elliptic, oblong, or oblanceolate, serrate, the lower petiolate and lobed at base; heads numerous; involucre 7–9 mm high; rays 25–35, 6–8 mm long, ca 1 mm wide, the tube hairy; disk flowers numerous, slender; pappus tawny. Sandy roadside at ca 915 m in Washington County; California and Arizona; 1 (i). Our material has the pappus merely tawny, not brick red as reported elsewhere for the species.

*Heterotheca jonesii* (Blake) Welsh & Atwood Jones Goldenaster. [*Chrysopsis caespitosa* Jones, not Nutt.; *Chrysopsis jonesii* Blake]. Perennial caespitose herbs from a creeping subrhizomatous caudex; stems 4–8 cm tall, loosely villous; leaves 5–11 mm long, 1.5–4 mm wide, petiolate, the blades obovate to spatulate, pilose; heads solitary or 2 or 3; involucre 5–7.5 mm high, 6–10 mm wide, the bracts narrowly lance-oblong, strigose-pilose, the hyaline margins reddish; ray flowers 5–13, yellow, 4–6 mm long, 1.5–2.5 mm wide; pappus tawny; achenes 2–3 mm long, hairy. Ponderosa pine, manzanita, and Douglas fir communities, on sandstone or in sand, at 1580 to 2745 m in Garfield, Kane, and Washington (?) counties (the type presumably came from Springdale); endemic; 7 (ii).

*Heterotheca psammophila* Wagenkn. [*H. subaxillaris*, authors]. Annual or biennial

herbs; stems stout, 5–12 (20) dm tall, branching above, hispid hirsute and glandular upward; leaves mainly 1–7 cm long, ovate to lance-oblong, serrate to subentire, the lower petiolate, the upper cordate-clasping; heads numerous; involucre 8–12 mm high, glandular and canescent; rays 20–30, yellow, mainly 3–7 mm long; pappus tawny; achenes 2.4–3.8 mm long. Sandy roadside at ca 970 to 1350 m in Grand and Washington counties; Arizona to Texas, south to Mexico; 1 (i). The specimen from Grand County (Welsh & Moore 2745) is missing from BRY, the Washington County locality is reported by Meyer.

*Heterotheca villosa* (Pursh) Shinnery Goldenaster. [*Amellus villosus* Pursh; *Chrysopsis villosa* (Pursh) Nutt. ex DC.]. Perennial herbs, from a ligneous root-crown and taproot; stems several to numerous, forming rounded clumps, mainly 1.5–5 dm tall; herbage hirsute to strigose and more or less glandular; leaves 0.5–5 cm long, 2–10 mm wide, oblanceolate to spatulate or elliptic, green or silvery to gray-green, petiolate or subsessile; heads few to numerous, mainly corymbose; involucre 7–10 mm high, 7–12 mm wide; bracts lance-linear, green or chartaceous, the margins hyaline, sometimes reddish; rays 10–25, yellow, 6–10 mm long; pappus tawny; achenes 2–3 mm long, hairy. Our materials represent only a small portion of the vast array of variation within the *villosa* complex. Three infraspecific taxa are apparent among our specimens, but application of names is difficult. The following treatment is therefore tentative, with a definitive treatment awaiting monographic study.

- 1. Leaves green or gray-green, the surface apparent through the spreading to subappressed hairs; plants widespread ..... *H. villosa* var. *hispida*
- Leaves silvery or grayish, the surface seldom apparent through the usually appressed hairs; plants restricted ..... 2





stipitate-glandular to glabrous or less commonly with a few long blackish setae; cauline leaves much reduced; heads solitary or more commonly greenish black, stellate hairy, and with long black setae; pappus tawny. Lodgepole pine, spruce-fir, and grass-forb communities at 3050 to 3390 m in Duchesne, Summit, and Uintah counties; Alaska and Yukon to Mackenzie, south to California and New Mexico; South America; 13 (v).

#### HOFMEISTERIA Walp.

Shrubs; leaves opposite below, alternate above, simple, petiolate; heads discoid, few to several in terminal corymbose clusters; involucre campanulate; bracts striate, narrow, imbricated; receptacle naked; disk flowers whitish; pappus of 10–12 scabrous bristles and other short scales; achenes 5-angled, callos-thickened.

*Hofmeisteria pluriseta* Gray Arrowleaf. Shrubs, low, rounded, and intricately branched, mostly 3–8 dm tall; branchlets green, glandular-puberulent, becoming white barked in age; leaves long petioled, the petioles 0.8–4 cm long, the blades hastately lobed to entire, 4–10 mm long, 2–4 mm wide; heads small; involucre 4–9 mm high; bracts 3-lined, acuminate; disk flowers whitish. Reported for Utah in Munz (Flora of California, p. 267); to be sought on rock outcrops at lower elevations in Washington County; Nevada, California, and Arizona; 0 (0).

#### HULSEA T. & G.

Perennial viscid-pubescent aromatic herbs; leaves alternate, simple; heads radiate; involucre hemispheric, the bracts subequal in 2 or 3 series, herbaceous, finally reflexed; receptacle convex, naked; ray flowers yellowish to purplish, pistillate, fertile; disk flowers perfect, fertile; pappus of 4 hyaline scales united at the base; achenes compressed, angled, villous.

*Hulsea heterochroma* Gray Perennial herbs from a stout taproot; herbage viscid-villous, scented, 3–10 (12) dm tall; basal leaves oblanceolate or spatulate, tapering to a broadly petioled base, dentate; cauline leaves mainly 3–10 cm long, 1.5–3.5 cm

wide, sessile, and more or less clasping; heads conspicuous, in racemose or corymbose clusters; bracts with long-attenuate, often reddish tips, subequal to the disk; rays reddish to purple or yellowish, hairy and glandular; pappus scales unequal, lacerate; achenes 6–7 mm long. Pinyon-juniper community at 2135 m in the Beaverdam Mountains, Washington County (Higgins 1410 BRY); Nevada and California; 1 (0).

#### HYMENOCLEA T. & G.

Xerophytic shrubs; leaves alternate, linear, usually entire; heads discoid, small, numerous, mostly glomerate-paniculate, with both sexes in each leaf axil, the staminate above the pistillate; staminate heads several-flowered; pistillate heads 1-flowered; involucre becoming indurated and beaked in fruit, the bracts persistent as scarious wings; pappus none.

*Hymenoclea salsola* T. & G. Burrobrush. Shrubs, 6–12 (15) dm tall; branchlets green, becoming straw colored to gray in age; herbage yellow green, resinous, glabrous or scabrous; leaves 2–5 cm long, linear, entire; staminate heads 2–3 mm high, 2.5–5 mm wide, the bracts obtuse to rounded, ciliate on the hyaline margin; pistillate heads mainly 6–9 mm high at maturity, the middle and upper bracts with white, chartaceous, broadly rounded, erose margins, longitudinally veined. Blackbrush, creosote bush, and Joshua tree communities at 670 to 900 m in Washington County; Nevada, Arizona, and California; 19 (ii).

#### HYMENOPAPPUS L'Her

Perennial herbs; leaves alternate or mainly basal (and still alternate), mainly pinnatifid; heads discoid, the flowers perfect; involucre bracts in 2 or 3 series, subequal, at least the inner with broad rounded scarious or hyaline margins; receptacle flat, naked or rarely chaffy; corollas yellow or white; anthers sagittate; pappus of several membranous scales; achenes 15- to 20-nerved, 4- or 5-angled.

TURNER, B. L. 1956. A cytotaxonomic study of the genus *Hymenopappus* (Compositae). *Rhodora* 58:163–308.

*Hymenopappus filifolius* Hook. Perennial subscapose herbs; stems 5–60 (100) cm tall,

tomentose to glabrate; basal leaves 3–20 cm long, twice pinnately dissected, the ultimate divisions mainly 2–25 mm long, minutely punctate; cauline leaves lacking or several, much reduced upward; heads solitary or more commonly few to numerous, turbinate to campanulate, with 10–59 flowers or more, on peduncles 0.5–10 cm long or more; involucre bracts mainly 3–14 mm long; corollas yellow or white, 2–7 mm long; pappus

of narrowly oblong scales; achenes 3–7 mm long, densely hairy. This is a polymorphic species, which consists of a series of geographic and/or edaphically correlated infraspecific taxa. Those taxa peripheral to the main body of the species in the Colorado Plateau province are the most distinctive. The following treatment differs from that of Turner (1956) and represents a more conservative approach.

1. Basal leaf axils sparingly tomentose or glabrous; stems scapose, or with 1 or 2 leaves; plants of high elevations ..... *H. filifolius* var. *alpestris*
- Basal leaf axils prominently white-tomentose; stem leaves often more than 2; plants of middle and lower elevations ..... 2
- 2(1). Corollas 2–3 mm long; flowers fewer than 30; plants of Daggett and Uintah counties ..... *H. filifolius* var. *luteus*
- Corollas 3–7 mm long, or, if shorter, not of Daggett or Uintah counties; flowers in main heads often more than 30; leaves more coarsely dissected; plants of various distribution ..... 3
- 3(2). Flowers white; achene hairs 0.5–1 mm long; plants of Washington County ..... *H. filifolius* var. *eriopodus*
- Flowers yellow; achene hairs 1–2 mm long; plants more widely distributed ..... 4
- 4(3). Leaves mainly basal; plants of the Great Basin ..... *H. filifolius* var. *nanus*
- Leaves cauline and basal; plants of the Colorado drainage system ..... *H. filifolius* var. *cinereus*

**Var. *alpestris* (Maguire) Shinnery** [*H. nudipes* var. *alpestris* Maguire; *H. nudipes* Maguire; *H. filifolius* var. *nudipes* (Maguire) Turner]. Ponderosa pine, western bristlecone pine, sagebrush-grass, limber pine, aspen, and alpine tundra communities, commonly on limestone or thermally modified igneous outcrops, at 2445 to 3450 m, in Beaver, Carbon, Duchesne, Emery, Iron, Garfield, Kane, Milard, Piute, Sanpete, Sevier, Summit, Utah, and Washington counties; Wyoming; 46 (ix). This is the most distinctive of the varieties within *H. filifolius* in Utah.

**Var. *cinereus* (Rydb.) Johnston**. [*H. cinereus* Rydb.; *H. lugens* Greene; *H. filifolius* var. *lugens* (Greene) Jepson; *H. filifolius* var. *megacephalus* Turner, as to Utah materials; *H. pauciflorus* Johnston, type from near Bluff; *H. filifolius* var. *pauciflorus* (Johnston) Turner; *H. tomentosus* Rydb., type from St. George; *H. filifolius* var. *tomentosus* (Rydb.) Turner; *H. niveus* Rydb., type from Springdale]. Blackbrush, warm desert shrub, salt desert shrub, sand sagebrush-ephedra, pinyon-juniper, ponderosa pine, and sagebrush communities at

1065 to 2685 m in Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Kane, San Juan, Uintah, Washington, and Wayne counties; Colorado, California, Arizona, New Mexico, and Texas; 144 (xxix). The variety *cinereus*, as interpreted herein, includes three largely sympatric phases that were treated by Turner (1956) at varietal rank. Although there is a tendency for these phases to be geographically correlated, they are connected completely by series of intermediates, and they can be segregated only arbitrarily. Turner noted that herbarium specimens of var. *megacephalus* from eastern Utah, inter alia, carried a "hodge-podge of annotations: *H. lugens*, *cinereus*, *pauciflorus*, *tomentosus*, *eriopodus*, etc.," and further that "the possibility exists that the variety [*megacephalus*] here typified includes only the individuals from Clark County, Nevada, and vicinity, and that most of the remaining material to the east represents either a weakly defined separate variety or a common area of extensive hybridization and introgression among the several peripheral taxa mentioned

above, . . .” A phase of the *cinereus* complex from Washington County has cauline leaves well developed and plant bases appearing bulbous due to a copious tomentum. These plants are apparently intermediate between var. *tomentosus* (Rydb.) Turner, in a narrow sense, and var. *eripodus* (A. Nels.) Turner, which share the feature of the “bulbous” bases.

**Var. *eripodus* (A. Nels.) Turner** [*H. eripodus* A. Nels., type from Diamond Valley]. Pinyon-juniper community at 1675 to 2135 m in Washington County; California to Nevada; 3 (0). This variety is evidently rare in Utah, and might best be treated within an expanded var. *cinereus* (q.v.).

**Var. *luteus* (Nutt.) Turner** [*H. luteus* Nutt.]. Salt desert shrub, mixed cool desert shrub, and pinyon-juniper communities at 1525 to 1830 m in Daggett, Summit, and Uintah counties; Wyoming and Colorado; 7 (ii). The small flowers and finely divided leaves appear to be diagnostic for this variety.

**Var. *nanus* (Rydb.) Turner** [*H. nanus* Rydb.]. Black sagebrush-rabbitbrush, pinyon-juniper, and ponderosa pine communities at 1490 to 2300 m in Beaver, Garfield, Iron, Juab, Millard, Piute, Sevier, Tooele, and Washington counties; Nevada, California, and Arizona; 26 (v).

HYMENOXYS Cass.

Perennial or biennial herbs from a taproot and commonly with a pluricipital caudex; stems simple or branched; leaves basal or basal and cauline, simple and entire or pinnately to ternately divided; heads radiate, pedunculate; involucre hemispheric; bracts in 2 or 3 series, the outer distinct or connate basally, subequal or imbricate, herbaceous or cartilaginous; receptacle naked, hemispheric; ray flowers yellow, pistillate, fertile, prominently veined, 3-toothed; disk flowers perfect, fertile; pappus scales usually 5, hyaline, nerved or nerveless, the nerve often produced into an awn; achenes obpyramidal, more or less 5-angled, appressed hairy.

- 1. Leaves entire, essentially all basal ..... 2
- Leaves pinnatifid or palmatifid, or some entire, the cauline ones well developed ..... 5
- 2(1). Involucral bracts sparsely pubescent or glabrous apically, the margins thin and scarious or hyaline ..... 3
- Involucral bracts moderately to densely villous-pilose or some rarely glabrous, the margins not at all or only narrowly scarious ..... 4
- 3(2). Plants depressed pulvinate-caespitose, acaulescent; outer involucral bracts recurved, thickened and reddish apically; disks less than 10 mm wide ..... *H. lapidicola*
- Plants merely caespitose, scapose; outer involucral bracts erect, not thickened and seldom reddish apically; disks over 10 mm wide ..... *H. torreyana*
- 4(2). Plants pulvinate-caespitose; caudex branches clothed with a marcescent thatch of erect-ascending leaf bases; leaves mainly linear, cuspidate apically ..... *H. depressa*
- Plants seldom pulvinate-caespitose; caudex branches without a definite thatch of ascending or erect leaf bases; leaves various, sometimes cuspidate apically ...  
..... *H. acaulis*
- 5(1). Disks 18–30 mm wide or more; involucral bracts similar, distinct, in 2 or 3 indefinite subequal series; herbage villous-tomentose; plants of high elevations ....  
..... *H. grandiflora*
- Disks 7–22 mm wide; involucral bracts in 2 dissimilar series, the outer thickened and united at the base ..... 6
- 6(5). Plants silvery-canescant; leaves entire or 3-cleft, the blades or segments 1.5–4 mm wide ..... *H. subintegra*
- Plants green, or, if silvery-canescant, the leaves commonly 3- to 5-cleft ..... 7
- 7(6). Plants apparently biennial, with an evident basal rosette and taproot; cauline leaves numerous, gradually reduced upward, ternate or palmatifid ..... *H. cooperi*



- Plants perennial, from a taproot and caudex; cauline leaves rather well developed, palmatifid to entire ..... 8
- 8(7). Stems merely glandular or glandular-scabrous; plants of low elevation saline meadows in western Utah ..... *H. lemmonii*
- Stems more or less villous; plants of various habitats, but seldom of saline meadows and not of western Utah ..... 9
- 9(8). Stems few to several from a pluricipital caudex; leaf bases conspicuously long-villous below; leaf segments mainly 1–2.5 mm wide ..... *H. richardsonii*
- Stems solitary or few from a simple or branched caudex; leaf bases glabrous or only somewhat hairy; leaf segments 2–6 mm wide ..... *H. helenoides*

*Hymenoxys acaulis* (Pursh) Parker [*Gailardia acaulis* Pursh]. Perennial caespitose herbs from a short multicipital caudex, the caudex branches clothed with short brownish or blackish marcescent leaf bases, 2–50 cm tall, villous to glabrous; leaves 1–6 cm long, 2–8 mm wide, all basal or some cauline, glandular-punctate or epunctate, linear to oblanceolate, entire; heads solitary (rarely 2);

disk 7–20 mm broad; bracts distinct, in 2 or 3 subequal series, 4–9 mm high; rays 5–9, yellow, 6–15 mm long; pappus scales 2.5–4.5 mm long, acute or shortly awned; achenes 2.5–4.5 mm long. This is a complex entity, consisting of a series of morphological phases, which are more or less geographically or edaphically correlated.

- 1. Plants with 1–4 (or more) cauline leaves; stems simple or branched ..... *H. acaulis* var. *ivesiana*
- Plants scapose, with cauline leaves lacking or rarely with 1; scapes unbranched ..... 2
- 2(1). Leaves linear to linear-oblanceolate, conspicuously glandular-punctate, sparingly long-hairy to glabrous; plants of the Colorado drainage system ..... *H. acaulis* var. *arizonica*
- Leaves narrowly to broadly oblanceolate, inconspicuously glandular-punctate, merely punctate, or epunctate, or plants of the Great Basin, densely pilose to villous or glabrous ..... 3
- 3(2). Leaves epunctate or nearly so, glabrous or less commonly silky-hairy; plants of the Colorado drainage system ..... *H. acaulis* var. *caespitosa*
- Leaves punctate, silky-hairy, or less commonly glabrous; plants of the Great Basin ..... *H. acaulis* var. *acaulis*

**Var. *acaulis*** Sagebrush, mixed desert shrub, pinyon-juniper, and bunchgrass communities, often on windswept ridges, at 1525 to 2990 m in Beaver, Box Elder, Juab, Millard, Sanpete, Sevier, Tooele, and Washington counties; Idaho east to Saskatchewan, south to Nevada, Colorado, and Texas; 42 (viii). Specimens from the Great Basin might not belong to var. *acaulis* in a strict sense, and perhaps should be regarded as a separate variety. The problem cannot be solved on the basis of Utah specimens alone.

in Carbon, Daggett, Duchesne, Emery, Grand, Kane, San Juan, and Uintah counties; Colorado and Arizona; 108 (xvi).

**Var. *arizonica* (Greene) Parker** [*Tetranneuris arizonica* Greene]. Salt and sandy desert shrub, pinyon-juniper, sagebrush, blue grama, aspen, Douglas fir, white fir, and ponderosa pine communities at 1220 to 3175 m

**Var. *caespitosa* (A. Nels.) Parker** [*Tetranneuris acaulis* var. *caespitosa* A. Nels.; *Tetranneuris epunctata* A. Nels., type from Dyer Mine]. Shadscale-eriogonum, black sagebrush, sagebrush, pinyon-juniper, mountain brush, and alpine tundra, often on plateau margins and windswept ridges, at 1585 to 3510 m in Carbon, Daggett, Duchesne, Emery, Grand, Sanpete, Sevier, Summit, and Uintah counties; Wyoming south to New Mexico; 87 (viii).

**Var. *ivesiana* (Greene) Parker** [*Tetranneuris ivesiana* Greene; *H. ivesiana* (Greene) Parker]. Sand sagebrush, ephedra, pinyon-juniper,

and ponderosa pine communities at 1150 to 2505 m in Garfield, Grand, Kane, San Juan, and Wayne counties; Colorado, New Mexico, and Arizona; 66 (xii). This variety approaches phases of the partially sympatric var. *arizonica* in stature, and it is possible to confuse some specimens when cauline leaves are lacking and the stems are unbranched. The varieties *acaulis*, *arizonica*, and *caespitosa* are tetraploids, i.e.,  $2n=60$ , whereas var. *ivesiana* is diploid, i.e.,  $2n=30$ . Because of this difference, Parker (1960. Leaflet. W. Bot. 9: 93) elevated this taxon to specific rank.

***Hymenoxys cooperi* (Gray) Cockerell** [*Actinella cooperi* Gray; *A. biennis* Gray, type from Washington County?]. Biennial or short-lived perennial herbs; stems 16–60 (80) cm tall, leafy, simple below, branched in a corymbose inflorescence above, often reddish, scurfy villous, canescent; basal rosette leaves mainly 2–10 cm long, pinnately divided, the linear lobes often again divided, mainly 1–1.5 mm wide; stem leaves longer than the internodes; heads (1) 3–50; involucre 5–6 mm high, 10–24 mm wide, hemispheric; bracts thickened and united basally, more or less pubescent and glandular; rays 7–13, yellow, 6–15 mm long; pappus scales acuminate; achenes 2–3 mm long, densely pilose. Sagebrush and pinyon-juniper communities at 975 to 2380 m in Garfield, Juab, Kane, and Washington counties; Nevada, California, and Arizona; 18 (i).

***Hymenoxys depressa* (T. & G.) Welsh & Reveal** [*Actinella depressa* Gray]. Pulvinate-caespitose scapose perennial herbs from a multicapital caudex, the caudex branches clothed with conspicuous, commonly erect marcescent leaf bases (often forming a thatch), 1–4 cm tall; scapes villous; leaves 0.4–3 (4) cm long, 1–2 (4) mm wide, linear to oblanceolate, the outer sparingly if at all glandular-punctate, the inner definitely so, sparingly villous to glabrous, cuspidate; heads solitary; disk 6–10 mm wide; involucre 4–6 mm high; bracts in 2 or 3 subequal series, long villous, the margins nonscarious, the apices erect; rays 5–7, yellow, 3–6 mm long; pappus scales 2–3 mm long, long-acuminate; achenes 2–3 mm long. Ephedra, sagebrush, shadscale, and pinyon-juniper woodland at 1340 to 2170 m in Duchesne, Emery, and eastern Sevier counties; endemic? There is

justification for inclusion of *H. depressa* within the *H. acaulis* complex, at some infraspecific rank. And the plants have been suggested as merely depauperate phases of that group. However, if they are ecologically controlled variations, they should be expected through much of the range of *H. acaulis*; but they are not. Dwarf forms of *H. acaulis*, especially of the var. *caespitosa*, have been mistaken for this species, but they are more hairy, have usually broader leaves, and lack glandular punctate. There is also a question of typification; the type of *H. depressus* was taken by Fremont, on his second expedition in the Rocky Mountains. Fremont evidently traversed the area occupied by *H. depressa* in 1845, and the material could have come from western Emery County; 24 (iv).

***Hymenoxys grandiflora* (T. & G.) Parker** [*Actinella grandiflora* T. & G.]. Perennial herbs from a taproot and usually simple caudex, this clothed with brown marcescent leaf bases; stems mainly 5–25 cm tall, 1 to several, simple or branched basally, densely villous; leaves basal and cauline, 2–10 cm long, 2- or 3-times ternately or palmately divided, the lobes linear, villous to glabrate; heads solitary; disk 1.5–3 cm wide or more; involucre bracts subequal, in 2 or 3 series, 8–14 (16) mm high, densely villous-tomentose; rays 15–50, yellow, 25–35 mm long; pappus scales 3.5–7 mm long, attenuate; achenes 3–5 mm long. Sedge-forb communities at or above timberline, often in talus or rockstripes, at 3050 to 3660 m in Duchesne, Grand, Salt Lake, San Juan, Summit, and Utah counties (Uinta, Wasatch, and La Sal mountains); Idaho to Montana, south to Colorado; 14 (ii). This is a strikingly beautiful yellow sunflower of alpine tundra in our mountains.

***Hymenoxys helenioides* (Rydb.) Cockerell** [*Picradenia helenioides* Rydb.]. Perennial herbs from a simple or branched caudex, this clothed with broad brown marcescent leaf bases; stems mainly 25–45 cm tall, simple below, branched above, scurfy and more or less villous; leaves basal and cauline, mainly 5–15 cm long, entire or 2- to 5-lobed, the lobes mainly 3–8 mm wide, finely glandular-punctate, glabrous or puberulent; heads 3–13, in corymbose clusters; disks 10–21 mm wide; involucre 6.5–8 mm high, the outer bracts

green, connate in the lower portion, more or less villous and glandular; rays 5–11, yellow, 8–19 mm long; pappus scales 2.5–3.5 mm long, acuminate; achenes 2.5–3 mm long. Mountain brush, sagebrush, and aspen communities, often in meadows, at 2440 to 2990 m in Emery, Garfield, Sanpete, and Sevier counties; Colorado and Arizona; 10 (i). This handsome plant has long remained obscure in Utah, partially due, no doubt, to its resemblance to *Helenium hoopesii* (q.v), with which it occurs in the aspen communities of central and southern Utah.

*Hymenoxys lapidicola* Welsh & Neese Pulvinate caespitose herbs from a multicapital caudex, this densely clothed with brown marcescent leaf bases, acaulescent; leaves all basal, 0.3–1.2 cm long, 0.8–2 mm wide, narrowly oblanceolate, the inner conspicuously glandular-punctate, the blades glabrous, the axils long-villous; heads solitary, immersed in the leaves; disks 5.5–9 mm wide; involucre 5–8 mm high; bracts distinct, in 2 or 3 subequal series, sparingly villous and suffused reddish, the margins scarious, the tips more or less squarrose-spreading and somewhat thickened; rays 5 or 6, yellow, 5–6 mm long; pappus scales lance-acuminate, 2.3–3 mm long; achenes 2–2.5 mm long, pilose. Pinyon-juniper and ponderosa pine-manzanita communities, often in rock crevices, at 1830 to 2476 m in Uintah County; endemic; 4 (0).

*Hymenoxys lemmonii* (Greene) Cockerell [*Picradenia lemmonii* Greene; *H. lemmonii* ssp. *greenii* Cockerell, type from Washington County (?)]. Perennial herbs from a taproot and short ligneous caudex, the caudex clothed with brown to straw-colored or purplish clasping leaf bases; stems 20–60 cm tall, 1 to few, glabrous; leaves cauline and basal, 2–15 cm long, pinnately parted, the lobes linear, 2–3 mm wide, glabrous, glandular-punctate; cauline leaves longer than the internodes, the uppermost often unlobed; heads 5–12; involucre 4.5–7 mm high, hemispheric, 8–14 mm wide; outer bracts green, sparsely scurfy and glandular, thickened dorsally and connate below; rays 6–10, yellow, 6–13 mm long; pappus lance-attenuate, 1.6–2 mm long; achenes 2.5–3 mm long, pilose. Saline rabbitbrush-alkali sacaton meadows at 1660 m in Millard, Tooele, and Washington (?) counties; Nevada and California; 3 (i).

*Hymenoxys richardsonii* (Hook.) Cockerell Colorado Rubberweed. [*Picradenia richardsonii* Hook.]. Perennial caespitose herbs from a pluricapital ligneous caudex, the caudex branches clothed with a thatch of marcescent brown leaf bases, usually with villous leaf axils; stems few to numerous, 6–40 (50) cm tall, simple below, branched; leaves basal and cauline 2–12 (15) cm long, ternate or with 5–7 linear segments, or some entire, pubescent to glabrous; involucre hemispheric, 5–8 mm high, the outer bracts connate basally, thickened dorsally, green or chartaceous, more or less villous; rays 9–14, yellow, 8–20 mm long; pappus 2–4.5 mm long, acuminate; achenes 2.5–4 mm long, pilose. Salt desert shrub, cool desert shrub, pinyon-juniper, sagebrush, mountain brush, ponderosa pine, aspen, fir, and western bristlecone pine communities at 1460 to 2870 m. Our material falls into two varieties, a low plant with 1–5 large heads of Daggett and Uintah counties, belonging to var. *richardsonii*, and a taller plant with 3–20 smaller heads of Beaver, Carbon, Duchesne, Emery, Garfield, Kane, Millard, Piute, Sanpete, Sevier, Uintah, and Wayne counties, belonging to var. *florabunda* (Gray) Parker; Alberta and Saskatchewan to Arizona and Texas; 129 (xvii). The plants are considered poisonous to sheep, cattle, and goats.

*Hymenoxys subintegra* Cockerell Perennial (or biennial) herbs from a taproot; stems solitary or few, 10–60 cm tall, branched above; herbage silvery canescent; basal leaves often withered at flowering; cauline leaves numerous, 1.5–8 cm long, 2–4 mm wide, entire or 2- or 3-lobed; heads few to several; disks 9–12 mm wide; involucre 5–7 mm high; outer bracts connate basally, villous; rays ca 12–20, yellow, 5–10 mm long; pappus scales lance-acuminate, 2.8–3.2 mm long; achenes ca 3 mm long. Ponderosa pine, aspen, and spruce-fir communities in Sanpete (Maguire 20049 BRY) and Washington (reported by Meyer) counties; Arizona; 1 (0).

*Hymenoxys torreyana* (Nutt.) Parker [*Actinella torreyana* Nutt.]. Perennial caespitose scapose herbs from a stout pluricapital caudex, the caudex branches densely clothed with brown to straw-colored or ashy leaf bases, 3–10 cm tall, villous; leaves 1–7.5 (9)



cm long, 2–6 mm wide, all basal, glandular-punctate, narrowly oblanceolate, entire; heads solitary; disk 12–20 mm wide; involucre hemispheric, 5–10 mm high; bracts distinct, in 2 or 3 subequal series, less pubescent to glabrous apically, the margins scarious, not thickened apically, the tips erect, sometimes reddish; rays 10–16, yellow, 8–20 mm long; pappus scales ovate-acuminate, 2.8–3.5 mm long; achenes 2–3 mm long. Pinyon-juniper, sagebrush, and mountain brush communities at 1830 to 2200 m in Daggett and Uintah counties; Wyoming; 6 (0).

HYPOCHAERIS L.

Perennial subscapose herbs from taproots, the juice milky; leaves primarily basal, simple, pinnately lobed to pinnatifid, the cauline leaves small and bractlike; heads solitary or few in a branching inflorescence; involucre bracts in several series, greenish black, the inner ones with hyaline margins; receptacle chaffy; corollas of ray flowers only, perfect, yellow or purplish on the dorsal surface; pappus of plumose capillary bristles; style branches semicylindrical; achenes several-nerved, subterete, minutely roughened, long beaked.

*Hypochaeris radicata* L. Cat's-ears. Plants 1.5–5 dm tall, the stems simple or branched above, glabrous or spreading-hairy below; basal leaves 3–16 (25) cm long, 0.5–3.5 (5) cm broad, oblanceolate, pinnately toothed or pinnatifid, sparsely to moderately spreading-hairy above and below, rounded to obtuse apically, tapering to a broad petiole basally; cauline leaves alternate, minute or lacking; heads solitary, or more commonly 2–5; peduncles glabrous; involucre 5–15 mm high, 7–20 mm wide; bracts glabrous or stiffly hairy along the midribs; corollas numerous, longer than the bracts; achenes 4–7 mm long,

the beak mostly 2–3 mm long. Weedy species of disturbed soils in Davis and Salt Lake counties; widespread in North America; adventive from Europe; 2 (0).

INULA L.

Perennial tomentose herbs; leaves basal and cauline, alternate; heads radiate, large, hemispheric, few to numerous in cymose clusters; involucre bracts imbricate in several series; receptacle naked; ray flowers pistillate, yellow, 3-toothed; disk flowers perfect, fertile; anthers sagittate at the base; style branches of disk flowers linear; pappus of capillary bristles; achenes 4- or 5-ribbed.

*Inula helenium* L. Elecampane. Perennial herbs, mainly 6–20 dm tall, from thick roots; stems simple below; basal leaves 2–5 dm long, petiolate, the blades ovate to oblong, denticulate, rough-hairy above, velvety beneath; cauline leaves reduced upward, cordate-clasping, acute; heads large and showy; involucre 15–23 mm high, 30–50 mm wide; outer bracts foliaceous, ovate; ray flowers numerous, 18–30 mm long, narrow; achenes glabrous. Canal banks and moist meadows at 1370 to 1830 m in Sanpete and Utah counties; widespread in North America; adventive from Eurasia; 2 (i).

IVA L.

Annual or perennial herbs; leaves opposite, at least below; heads discoid, the pistillate flowers few, with corolla tubular or lacking; involucre campanulate; bracts subequal or imbricate in 1–3 series, sometimes with a short inner series subtending the achenes; receptacle chaffy, the receptacular bracts linear to spatulate; staminate flowers with abortive pistils, the styles undivided, the filaments monadelphous; anthers obtuse basally, almost distinct; pappus none; achenes compressed.

- 1. Leaves sessile or shortly petiolate, entire; plants rhizomatous, mainly less than 40 cm tall, of saline low-elevation sites ..... *I. axillaris*
- Leaves petiolate, serrate; plants taprooted annuals, mainly much over 40 cm tall, ruderal weeds ..... *I. xanthifolia*

*Iva axillaris* L. Poverty Weed. Perennial herbs from elongate rhizomes; stems 15–50 (60) cm tall, branched from the base; herbage

strigose to strigulose and more or less glandular; leaves opposite below, alternate above, 0.8–4.5 cm long, 4–15 mm wide, elliptic to

obovate or lanceolate; heads numerous in terminal bracteate spicate clusters, nodding, 3–7 mm wide; bracts connate, shallowly 4- or 5-lobed; pistillate flowers 4–8, perfect; achenes 2–3 mm long, glandular. Commonly in saline riparian sites in the warm desert shrub, salt desert shrub, pinyon-juniper, and aspen communities at 760 to 2440 m in all Utah counties; British Columbia to Manitoba, south to California, New Mexico, and Oklahoma; 60 (viii).

*Iva xanthifolia* Nutt. Marsh-elder. Coarse perennial herbs, mainly 4–25 dm tall, simple or branched, essentially glabrous below, glandular above; leaves opposite below, petiolate, the blades 4–20 cm long and about as wide, broadly ovate to lance-ovate, serrate and sometimes lobed, green above, canescent beneath; heads 2–4 mm thick, numerous, borne ebracteate in paniculate clusters; involucre bracts distinct, ovate; pistillate flowers 5; achenes sparsely pilose apically, ca 2 mm long. Ruderal weeds of disturbed soils at 1370 to 2290 m in Beaver, Duchesne, Emery, Iron, Kane, Millard, Salt Lake, Sevier, Summit, Uintah, Utah, and Wayne counties; Alberta to Saskatchewan, south to Washington, Arizona, and New Mexico; widely distributed elsewhere; 22 (iii).

KUHNIA L.

Perennial herbs from a woody caudex and taproot; stems branched, erect or ascending;

leaves alternate or some lower ones opposite; entire or lobed; heads discoid, several to numerous in paniculate clusters; involucre campanulate; involucre bracts in 4–7 series, the outer ones only graduated; receptacle naked; disk flowers perfect, fertile, whitish; style tips flattened, clavate; pappus of plumose bristles; achenes 10-ribbed.

*Kuhnia chlorolepis* Woot. & Standl. Perennial clump-forming herbs; stems 30–75 cm tall, much branched, minutely hairy; leaves 8–50 mm long (or more), 1–3 mm wide, entire or with a pair of basal lobes, linear; involucre 8–12 mm high; bracts linear to narrowly oblong, striate; corollas 6–7.5 mm long; achenes 4.8–5.2 mm long, dark brown, short-hairy. Rabbitbrush community in intermittent stream courses at 1890 to 2045 m in Uintah County; Colorado to Arizona, New Mexico, Texas, and Mexico; 2 (i).

LACTUCA L.

Annual, biennial, or perennial herbs; leaves alternate, entire or pinnatifid; flowers all raylike, yellow, blue, or white; heads paniculately arranged; involucre cylindrical; bracts imbricate in several series; receptacle flat, naked; pappus copious, of white or brownish capillary bristles; achenes oval, oblong, or linear in outline, compressed, ribbed on each face, short- to long-beaked.

- 1. Plants perennial, rhizomatous; rays long-exserted, blue ..... *L. tatarica*
- Plants annual or biennial; rays not long-exserted, yellow (often fading blue) or blue to white (in *L. biennis*) ..... 2
- 2(1). Achenes prominently 1-nerved on each side ..... 3
- Achenes prominently several nerved on each side ..... 4
- 3(2). Involucres 10–15 mm high in fruit; pappus 5–7 mm long; achenes 4.5–6.5 mm long, including the beak ..... *L. canadensis*
- Involucres 15–22 mm high in fruit; pappus 7–12 mm long; achenes 7–10 mm long ..... *L. ludoviciana*
- 4(2). Involucres cylindrical at anthesis; flowers not fading blue; plants cultivated and occasionally escaping ..... *L. sativa*
- Involucres tapering to the apex at anthesis; flowers fading blue ..... 5
- 5(4). Achenes with a long filiform beak as long as or longer than the body of the achene; pappus white ..... *L. serriola*
- Achenes with a short beak much shorter than the body of the achene; pappus brownish ..... *L. biennis*

*Lactuca biennis* (Moench) Fern. [*Sonchus biennis* Moench]. Annual or biennial, glabrous or hairy (on midvein of leaves) herbs; stems erect, mainly 6–20 (35) dm tall; leaves mainly 10–40 cm long, 4–20 mm wide, pinnatifid or merely toothed; heads 13- to 50-flowered, numerous, arranged in a narrow paniculate inflorescence; rays bluish to white; pappus brownish; achenes 4–5.5 mm long, prominently several nerved on each face, beakless or short beaked. Moist sites at ca 1800 m in Salt Lake County (Arnow 2561 BRY, UT); Alaska to Newfoundland, south to California, Colorado, and North Carolina; 1 (0).

*Lactuca canadensis* L. Annual or biennial, glabrous or hirsute herbs; stems erect, 3–25 dm tall; leaves mainly 10–35 cm long, 1–12 cm wide, entire to pinnatifid; heads mostly 13- to 22-flowered, arranged in open panicles; rays yellow (fading blue); pappus white; achenes black, obovate, transversely rugose and with 1 prominent longitudinal vein on each face, 4.5–6.5 mm long, including the beak from half as long to as long as the body. Weedy species of moist sites at ca 1155 m in Kane County (Atwood 4118 BRY); widespread in U.S.; 1 (0).

*Lactuca ludoviciana* (Nutt.) Riddell [*Sonchus ludovicianus* Nutt.]. Biennial or short-lived perennial herbs; stems 6–15 dm tall or more; leaves 10–35 cm long or more, mainly 1–10 (20) cm wide, commonly pinnatifid and weakly spinose-toothed, setose-hispid on the lower midrib, the uppermost auriculate-clasping; heads numerous in an open paniculate cluster, the peduncles bracteate; involucre 15–22 mm high in fruit; heads mostly 20- to 50-flowered, the flowers yellow or sometimes blue, fading blue; pappus white, 7–10 mm long at maturity; achenes flattened, blackish, with a longitudinal median nerve on each face, transversely rugulose, 4–5 mm long. Collected once in Salt Lake County (without collector, UT); widespread in the northwestern U.S.; 1 (0).

*Lactuca sativa* L. Lettuce. Annual herbs; stems erect, mostly 5–12 dm tall, glabrous; leaves mainly 10–30 cm long and as broad, undulate-crested and serrate, glabrous; involucre 7–10 mm high; heads ca 15-flowered, the flowers yellow, not fading blue,

numerous in a paniculate cluster; pappus white; achenes brownish, oblanceolate in outline, flattened, hispid apically, 3.5–4.5 mm long, with 5–7 longitudinal nerves on each face, the beak 2.5–3.5 mm long. Cultivated food plant in much of Utah; introduced from Europe; 2 (0).

*Lactuca serriola* L. Prickly Lettuce. [*L. scariola*, *scarriola*, orthographic variants]. Biennial or winter annual herbs; stems erect, 3–18 dm tall, hispid below or glabrous overall; leaves mainly 3–30 cm long, 1–10 cm wide, pinnatifid or pinnately lobed, or merely spinose-toothed, the blades vertically oriented (twisted at the base), setose-hispid on main veins beneath; involucre 7–15 mm high at maturity; heads mostly 6- to 12-flowered, the flowers yellow, fading blue, several to numerous in a paniculate cluster; pappus white; achenes brown, the body obovate to oblong in outline, flattened, hispid along margin apically, 3–4.5 mm long, with 5–8 longitudinal nerves on each face, the beak 3–7 mm long. Ruderal weeds at 850 to 2440 m, probably in all Utah counties, widely distributed in the U.S.; adventive from Europe; 37 (v). This species invades lower elevation range lands, where it is eaten by wildlife and livestock. It is reported to produce fertile hybrids with *L. sativa* (q.v.).

*Lactuca tatarica* (L.) C.A. Mey. Blue Lettuce. Perennial rhizomatous herbs; stems 2–12 dm tall, glabrous; leaves 4–20 cm long, 5–35 mm wide, linear to lanceolate or oblong, entire, toothed, lobed, or pinnatifid, short-petiolate below, sessile above; involucre 10–20 mm high; heads cylindric, 15- to 50-flowered, the flowers blue, numerous in an elongate paniculate cluster; pappus white; achenes black to pale, oblong-lanceolate in outline, flattened, 4–7 mm long, with several longitudinal nerves on each face, the beak ca 2 mm long. Marshes, canal and stream banks, and roadsides at 1370 to 2440 m in Cache, Daggett, Duchesne, Garfield, Grand, Iron, Juab, Kane, Millard, Piute, Salt Lake, Sevier, Tooele, Uintah, Utah, and Weber counties; Alaska to Minnesota, south to California and Missouri; 39 (vii). Our material belongs to ssp. *pulchella* (Pursh) Stebbins [*Sonchus pulchellus* Pursh], the North American phase of a circumboreal species.



## LAPSANA L.

Annual herbs from taproots, the juice milky; leaves alternate, simple, subentire to toothed or lyrate-pinnatifid; heads numerous; involucre bracts in 2 series, the inner ones large and keeled, the outer minute, greenish; receptacle naked; corollas of ray flowers only, perfect, yellow; pappus none; style branches semicylindrical; achenes subterete, several-nerved, tapering at both ends, beakless.

*Lapsana communis* L. Nipplewort. Plants mostly 2.5–10 dm tall, the stems erect, simple or branched, pubescent with stipitate glands or glabrous; leaves mostly 3–10 cm long and 1.4–5 (7) cm wide, the blades subentire to toothed, or the lower ones lyrate-pinnatifid, sparsely hairy to glabrous above and below; heads numerous, the peduncles glabrous or nearly so; involucre 5–8 mm high, 3–9 mm

1. Ray flowers yellow with a white tip; pappus setae merely scabrous; anthers black; plants rare in San Juan County ..... *L. platyglossa*
- Ray flowers white; pappus setae plumose; anthers yellow; plants locally common, widespread ..... *L. glandulosa*

*Layia glandulosa* (Hook.) H. & A. Tidytips. [*Blepharipappus glandulosus* Hook.]. Plants slender, the stems simple or branched, 0.8–3 dm tall or more, often reddish, with long spreading-ascending multicellular setae; leaves 0.8–6 cm long, 1.5–16 mm wide, often mainly basal, hispid, toothed to lobed, the cauline ones reduced upward and finally entire; heads solitary or 2 to numerous; involucre 6–9 mm high, 10–18 mm wide; bracts hispid and with some tacklike purplish black stipitate glands; rays white, 6–15 mm long; disk flowers numerous; ray achenes 3–4 mm long; disk achenes 3–6 mm long; pappus of 10–12 white flattened setose scales plumose to above the middle with straight capillary and tangled woolly hairs. Sagebrush-grass, grassland, and pinyon-juniper communities at 1370 to 1865 m in Daggett, Garfield, Juab, Kane, Millard, Salt Lake, Sanpete, Tooele, Utah, and Washington counties; British Columbia, south to Baja California and Arizona; 24 (i).

*Layia platyglossa* (Fisch. & Mey.) Gray [*Calichroa platyglossa* Fisch. & Mey.]. Plants slender, the stems erect, simple or branched,

broad, the bracts glabrous; flowers mostly 10–14; achenes 3–5 mm long. Weedy species of disturbed sites in Salt Lake County (Arnow 4747, BRY; UT); widely established in North America; adventive from Eurasia; 1 (0).

## LAYIA H. &amp; A.

Annual herbs from taproots; leaves mainly alternate, subentire to toothed or pinnatifid; heads radiate, solitary or few to several, subcorymbose; ray and disk flowers both fertile; involucre campanulate to broadly hemispheric; bracts with thin margins abruptly dilated below, enclosing the ray achenes; receptacle plano-convex, chaffy marginally; ray flowers 8–24, yellow or with the tips white; pappus of numerous bristles, awns, or scales, the bristles often plumose below; ray achenes obcompressed, commonly glabrous and epappose; disk achenes pubescent and pappose.

setose with long, multicellular hairs, often reddish; leaves mainly 1–6 cm long, 2–7 mm wide, with long, slender, spreading multicellular hairs, the cauline leaves reduced upward and finally entire; heads solitary or few; involucre 6–12 mm high, 12–20 mm wide; bracts hairy like the leaves and with some tacklike purplish black stipitate glands; rays yellow with white tips, 6–18 mm long; disk flowers numerous; ray achenes 3–4 mm long; disk achenes 3–5 mm long; pappus of scabrous setae. Dunes at ca 1375 m in San Juan County (Harrison 2545 BRY); California. Our material apparently belongs to var. *breviseta* Gray [ssp. *campestris* Keck], and this is apparently the only known station for the species east of California. The collection was taken in 1927. The plants resemble those of *Gaillardia*, in a general way, and our material has been filed for more than four decades in a folder of that genus.

## LEPIDOSPARTUM Gray

Shrubs; leaves alternate, linear, entire; heads several to numerous, in corymbose or

racemose clusters; heads discoid, the flowers perfect, yellow; involucre subcylindric; bracts chartaceous, imbricate in several series, rounded apically (at least the inner); receptacle flat, naked; anthers sagittate; style branches flattened; pappus of copious capillary bristles; achenes oblanceolate in outline, long-pilose.

*Lepidospartum latisquamum* Wats. Nevada Broomshrub. Shrubs mainly 6–15 dm tall or more; branchlets with prominent longitudinal striae, the striae glandular, the intervening areas tomentose; leaves 0.5–3 cm long, linear, 0.5–1 mm wide, apiculate; heads 4- to 7-flowered; involucre 8–10 mm high, 3.5–6 mm wide; bracts chartaceous, tomentose, the outer apiculate, very short, the inner broadly rounded and more or less hyaline margined; achenes 4–5 mm long, long-pilose with copious white hairs 3–4 mm long. Rabbitbrush community along a wash at 1705 to 1740 m in Millard County (Pine Valley); Nevada and California; 7 (iii).

#### LEUCELENE Greene

Perennial rhizomatous herbs; leaves alternate, simple, entire, linear or subulate; heads radiate, solitary or few to many; involucre turbinate; bracts imbricate in several series, green, the margins scarious; ray flowers white or tinged pink, pistillate; disk flowers perfect, fertile, yellow; pappus of capillary bristles; achenes subcylindric or somewhat compressed.

SHINNERS, L. H. 1946. Revision of the genus *Leucelene* Greene. *Wrightia* 1:82–89.

1. Rays 10–12 mm long, ca 4 mm wide; pappus 6–9 mm long ..... *L. juncea*
- Rays 15–25 mm long, 6–10 mm wide; pappus 12–17 mm long ..... 2
- 2(1). Flowers white (or pink?, and drying pinkish); stems ligneous, branching from the base, forming rounded clumps; leaves stiff, spreading; plants of Emery and Grand counties ..... *L. entrada*
- Flowers pink or pink-purple; stems various, but, if branched from the base, the leaves either lax or the plants of different distribution ..... *L. grandiflora*

*Lygodesmia entrada* Welsh & Goodrich Entrada Rushpink. Perennial herbs from a subterranean caudex, branching from the base, the branches ligneous and wiry, mainly 25–45 cm tall; leaves entire, linear or acicular, 5–30 (70) mm long; peduncles with numerous bracts, 12–20 cm long; involucral

*Leucelene ericoides* (Torr.) Greene Roseheath. [*Inula* ? *ericoides* Torr.; *L. arenosa* Heller; *Aster bellus* Blake; *A. leucelene* Blake; *A. hirtifolius* Blake]. Perennial herbs from a branching caudex and rhizome, simple or more commonly branched, 3–17 cm tall, strigose and more or less glandular; leaves 2–10 mm long, 1–2 (3) mm wide, linear to spatulate, becoming subulate upward; heads solitary or few to many; involucre 5–7 mm high, 5–12 mm wide; bracts in 3–5 series; rays 12–25, white to pink, 3–6 mm long; achenes appressed-hairy. Blackbrush, desert shrub, salt desert shrub, pinyon-juniper, and ponderosa pine communities at 1370 to 2595 m in Beaver, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane, Millard, Piute, Salt Lake, San Juan, Sanpete, Sevier, Tooele, Uintah, Utah, Washington, and Wayne counties; Nevada and California, east to Kansas, south to Arizona and Mexico; 145 (xvii).

#### LYGODESMIA D. Don

Perennial or annual herbs with milky juice; leaves alternate or mainly basal and still alternate, entire or pinnatifid; heads solitary or few to many in corymbose or paniculate clusters; flowers all raylike, pink to pink-purple or white; involucre cylindric; bracts mostly 5–9, with some more or less reduced outer ones; receptacle naked; pappus of numerous capillary bristles; achenes linear, subterete, prominently several nerved.

bracts hyaline-margined, the outer 5–10 mm long, fimbriate, the inner ca 6, 16–18 mm long, puberulent at the apex; rays white, ca 3 cm long; pappus barbellate, sordid, 10–15 mm long; achene ribs glabrous. Juniper and mixed desert shrub communities at 1340 to 1465 m in Emery and Grand (type from near

Courthouse Wash) counties; endemic; 3 (i). The status of this entity is unclear; certainly it is a portion of the *grandiflora* complex. Further work is indicated.

*Lygodesmia grandiflora* (Nutt.) T. & G. Showy Rushpink. [*Erythremia grandiflora* Nutt.]. Perennial herbs from deeply placed elongate rhizomes; stems 0.6–5 dm tall, simple or branched from the base or above; leaves alternate, 0.5–10 cm long or more, 1–5 mm wide, attenuate, gradually to abruptly

reduced upward; involucre cylindric, 18–25 mm high, densely hairy to glabrous (?), the outer mostly short and ovate to lance-ovate, the inner 5–9 equal, narrowly oblong; rays 5–10, pink, pink-purple, or rarely white, mostly 2–4 cm long; pappus of numerous barbellate tawny bristles; achenes 12–18 mm long, ribbed, glabrous. Our material consists of three taxa, which have been regarded at specific rank. Intermediates between the taxa suggest a more conservative approach.

1. Main involucre bracts 8 or 9; flowers 8–12; plants of east central and north-eastern Utah ..... *L. grandiflora* var. *grandiflora*
- Main involucre bracts 5 or 6; flowers 5–7 (10); plants of southeastern and western Utah ..... 2
- 2(1). Uppermost leaves reduced to linear scales mainly 3–10 mm long; achenes 13–19 mm long, smooth on the lower surface ..... *L. grandiflora* var. *dianthopsis*
- Uppermost leaves not reduced to scales, mainly 20–40 mm long; achenes 10–13 mm long, rugose on the lower surface ..... *L. grandiflora* var. *arizonica*

**Var. *arizonica* (Tomb) Welsh** comb. nov. [based on: *Lygodesmia arizonica* Tomb Sida 7:530. 1970]. Blackbrush-ephedra and Indian ricegrass-dropseed communities at 1125 to 1590 m in Kane and Wayne counties; Arizona; 7 (ii).

**Var. *dianthopsis* (D.C. Eaton) Welsh** comb. nov. [based on: *Lygodesmia juncea* var. *dianthopsis* D.C. Eaton in Watson Rep. U.S. Geol. Explor. 40th Parallel, Bot. 5:200. 1871; *L. dianthopsis* (D.C. Eaton) Tomb]. Sagebrush-grass, pinyon-juniper, and mountain brush communities at 1370 to 2440 m in Beaver, Cache, Kane, Millard, Salt Lake, Sevier, and Utah counties; Nevada; 22 (iii). Intermediate specimens transitional to var. *arizonica* occur in south central Utah.

**Var. *grandiflora* [*L. grandiflora* var. *stricta* Maguire, type from south of Price].** Shadscale, sagebrush, pinyon-juniper, mountain brush, ponderosa pine, and aspen-sagebrush communities at 1460 to 2750 m in Carbon, Daggett, Duchesne, Emery, Garfield, Grand, and Uintah counties; Wyoming south to New Mexico; 37 (vii). The var. *stricta* is a phase with stiffly erect leaves, but seems to represent only an ecological variant. Specimens of intermediate nature occur southward with both varieties *arizonica* and *dianthopsis*.

*Lygodesmia juncea* (Pursh) D. Don [*Prenanthes juncea* Pursh]. Perennial glabrous herbs from a deeply placed elongate root (rhizome?); stems mainly 1.5–6 dm tall, much

branched; leaves stiff, entire, mainly 1–4 cm long, 1–4 mm wide, the upper ones reduced to subulate scales; heads few to several, mainly 5 (4–10)-flowered; flowers pink or less commonly white; involucre 9–16 mm high, with 4–8 main bracts and several shorter outer ones; pappus tawny; achenes ca 5–7 mm long, several nerved. Our few specimens from sandy sites in mixed desert shrub and juniper communities at ca 1400 to 1590 m in Emery and Juab counties; British Columbia to Minnesota, south to Arizona and Arkansas; 3 (0). This is mainly a Great Plains species, with disjunct populations westward, often in sandy habitats.

#### MACHAERANTHERA Nees

Annual, biennial, or perennial herbs from taproots; leaves alternate, entire or pinnatifid to toothed or lobed, spinulose apically and the teeth, when present, spinulose; heads solitary or 2 to numerous; involucre bracts in several series, herbaceous apically, chartaceous or coriaceous basally, mainly squarrose; rays pistillate and fertile, pink, lavender, pink-purple, or white, or lacking; receptacle naked; anthers not caudate; pappus of capillary bristles; achenes narrowly oblong in outline.

CRONQUIST, A. AND D. D. KECK. 1957. A reconstitution of the genus *Machaeranthera*. Brittonia 9:231–239.



- 1. Heads discoid; leaves spinose-toothed ..... *M. grindelioides*
- Heads radiate; leaves various, but not conspicuously spinose-toothed ..... 2
- 2(1). Plants perennial, from a definite caudex, of montane sites, commonly on granite, limestone, or quartzite ..... *Aster kingii* D.C. Eaton (q.v.)
- Plants biennial, winter annual, or annual (rarely short-lived perennial), the caudex not well developed; plants of various habitats and substrates ..... 3
- 3(2). Leaves pinnately dissected; plants annual ..... *M. tanacetifolia*
- Leaves merely toothed to entire; plants mainly biennial or short-lived perennial ..... 4
- 4(3). Involucral bracts with green tip commonly equaling or longer than the chartaceous base, the long-tapering apices often reflexed ..... *M. bigelovii*
- Involucral bracts with green tip much shorter than the chartaceous base, the reflexed to erect tips shortly attenuate to acute ..... *M. canescens*

*Machaeranthera bigelovii* (Gray) Greene [*Aster bigelovii* Gray; *M. mucronata* Greene, sensu Utah materials]. Short-lived perennial (biennial in some?) herbs from a taproot, a caudex not or only poorly developed; stems 11–35 cm long, puberulent below, becoming glandular to stipitate-glandular above; basal leaves often withered at anthesis; cauline leaves oblanceolate to linear or oblong, mainly 1–7.5 cm long, 1.5–8 mm wide, the surfaces glabrous and more or less glandular or stipitate-glandular, ciliate, entire to spinose-toothed; heads few to many in corymbose inflorescences; involucre 9–12 mm high, 12–23 mm wide; bracts lance-linear, attenuate apically, the green apex subequal to the coriaceous base, especially in the outer bracts, commonly spreading-reflexed, glandular and glandular-ciliate; rays 21–31, violet or pink-purple, 10–15 mm long, 2–4.2 mm wide; pappus off-white; achenes glabrous or sparingly strigose, 2.5–4.2 mm long. Mountain brush, aspen, spruce-fir, and alpine meadow communities at 2440 to 3355 m in Garfield, Iron, Kane, and Washington counties (Henry Mountains, Markagunt Plateau, and Kolob Terrace); Colorado, New Mexico, and Arizona; 18 (iii).

*Machaeranthera canescens* (Pursh) Gray [*Aster canescens* Pursh]. Biennial (winter annual) or short-lived perennial herbs from a

taproot, a caudex seldom developed; stems 8–60 cm tall or more, variously glabrous, glandular, or puberulent; basal leaves withered or persistent at anthesis; cauline leaves linear to oblong or oblanceolate, 1–10 cm long, 1–22 mm wide, the surfaces glabrous, puberulent, or glandular, commonly ciliate, entire or toothed; heads few to many in paniculate to corymbose clusters; involucre 6–10 (12) mm high, 6–18 mm wide; bracts linear to oblong, attenuate to abruptly attenuate, the green apex commonly much shorter than the coriaceous base, sometimes spreading-reflexed, glandular and or puberulent; rays 15–25, pink to pink-purple or white, 5–12 mm long, 1.5–2.5 mm wide; pappus off-white; achenes pilose, ca 2.5 mm long. The *canescens* complex consists of a series of intergrading taxa, which, in the extreme, are distinctive and geographically or edaphically correlated. Many names have been applied to members of the complex, and specimens often bear annotations of several of the names involved. This is partially in recognition of the intermediate nature of the specimens and partially due to the quality of diagnostic criteria. It seems best to treat the materials from Utah as belonging to a single polymorphic species, consisting of four intergrading varieties.

- 1. Leaf surfaces glabrous, the upper leaves commonly glandular to stipitate-glandular; upper branches usually with numerous bracteate leaves; plants of southeastern Utah, rarely elsewhere ..... *M. canescens* var. *vacans*
- Leaf surfaces puberulent, the upper leaves sometimes also glandular; upper branches lacking bracteate leaves or variously so; plants of broad distribution, but not of southeastern Utah ..... 2

- 2(1). Upper branches with numerous bracteate leaves; rosette leaves abruptly and angularly lobed or toothed; plants biennial, of central and southwestern Utah ...  
 ..... *M. canescens* var. *leucanthemifolia*
- Upper branches seldom especially bracteate; rosette leaves various; plants biennial or short-lived perennial, of various distribution ..... 3
- 3(2). Involucral bracts 1–1.5 (2) mm broad, abruptly attenuate apically; plants often perennial, mainly of higher middle elevations ..... *M. canescens* var. *commixta*
- Involucral bracts 0.5–1 mm wide, rather gradually attenuate apically; plants often biennial, mainly of lower to middle elevations ..... *M. canescens* var. *canescens*

**Var. *canescens*** [*M. pulverulenta* (Nutt.) Greene]. Salt desert shrub, mixed desert shrub, pinyon-juniper, mountain brush, aspen-sagebrush, Douglas fir, and lodgepole pine communities at 1250 to 2900 m in Beaver, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane, Millard, Piute, Salt Lake, Sanpete, Sevier, Summit, Uintah, and Washington counties; British Columbia to Saskatchewan, south to California, Arizona, and Colorado; 102 (xiii). This is a variable complex of forms that differ in several morphological features, but further segregation seems unwarranted. I have been unable to distinguish *M. tephrodes* (Gray) Greene from among our rather large collection.

**Var. *commixta*** (Greene) Welsh comb. nov. [based on: *Machaeranthera commixta* Greene Pittonia 4:71. 1899, type from the Henry Mountains; *M. latifolia* A. Nels., type from Big Cottonwood Canyon, *M. leptophylla* Rydb., type from Logan; *M. paniculata* A. Nels., type from Parleys Canyon; *M. rubri-caulis* Rydb.; *Aster rubrotinctus* Blake]. Mountain brush, aspen, Douglas fir, sagebrush, spruce-fir, and alpine meadow communities at 1705 to 3420 m in Beaver, Cache, Carbon, Duchesne, Emery, Garfield, Iron, Juab, Millard, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, and Wayne counties; Wyoming and Colorado; 82 (v).

**Var. *leucanthemifolia*** (Greene) Welsh comb. nov. [based on: *Aster leucanthemifolius* Greene Erythaea 3:119. 1895; *M. leucanthemifolia* (Greene) Greene]. Blackbrush, mixed desert shrub, pinyon-juniper, mountain brush, and ponderosa pine communities at 915 to 2135 m in Beaver, Iron, Juab, Sanpete, Sevier, Utah, and Washington counties; Nevada and Arizona; 43 (xiii). This plant is mainly a xerophyte of sandy and silty habi-

tats at lower elevations in the Great Basin and lower Virgin River drainage systems; it is transitional at higher elevations with the preceding varieties. Phases of var. *canescens* from northeastern Utah have been regarded as portions of this variety, but they seem not to fit the concept of var. *leucanthemifolia*, whose type is from Mineral County, Nevada.

**Var. *vacans*** (A. Nels.) Welsh comb. nov. [based on: *Machaeranthera pulverulenta* var. *vacans* A. Nels. Bot. Gazette 56:70. 1913, type from San Juan County, Utah]. Salt desert shrub, mixed desert shrub, pinyon-juniper, and ponderosa pine communities at 1155 to 2380 m in Carbon, Emery, Garfield, Grand, Kane, Juab, San Juan, and Washington counties; Colorado, Arizona, and New Mexico; 61 (xix). This material has been treated as *M. linearis* Rydb., a glabrous-leaved phase of *M. canescens* whose type came from Yellowstone Park, Wyoming. Work of a monographic nature is necessary for the entire *canescens* complex. Additional research might indicate an older name at varietal rank for this taxon.

***Machaeranthera grindelioides*** (Nutt.) Shinnars [*Eriocarpum grindelioides* Nutt.; *Haplopappus nuttallii* T. & G.]. Perennial herbs from a woody caudex and stout taproot, the caudex branches more or less clothed with marcescent leaf bases; stems 2–30 cm tall, pilosulose or spreading-hairy below, stipitate-glandular and/or hairy above; basal leaves withered or persistent at anthesis; cauline leaves oblanceolate to spatulate or oblong, mainly 0.5–4.5 cm long, 2–12 mm wide, serrate, the teeth with spinulose tips 1–3 mm long, the surfaces pilosulose and/or stipitate-glandular; heads solitary or few to many in corymbose clusters; involucre 6.5–9.5 mm high, 8–15 mm wide;

bracts narrowly oblong, attenuate to an acute apex, the apical portion green or brown, the base chartaceous, erect, glandular; rays lack

ing; pappus off-white to brownish; achenes densely pilose, ca 3 mm long. Two distinctive varieties are present in Utah.

1. Plants dwarf, often monocephalous; leaves commonly clustered at stem bases; plants of semibarren habitats in the Great Basin ..... *M. grindelioides* var. *depressa*
- Plants seldom dwarf, often with more than 1 head; leaves mainly cauline; plants seldom of the Great Basin ..... *M. grindelioides* var. *grindelioides*

**Var. *depressa* (Maguire) Cronq. & Keck** [*Haplopappus nuttallii* var. *depressa* Maguire, type from Millard County]. Mixed desert shrub, pinyon-juniper, and mountain brush communities at 1465 to 2320 m in Beaver, Juab, and Millard counties; Nevada, a Great Basin endemic; 24 (xiv).

**Var. *grindelioides*** Blackbrush, mixed desert shrub, sagebrush, pinyon-juniper, and mountain brush communities at 1340 to 3175 m in Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Juab, Kane, Millard, Rich, San Juan, Sanpete, Sevier, Summit, Uintah, and Utah counties; Montana to Saskatchewan, south to Nevada, Arizona, and New Mexico; 98 (xiii). There is a tendency for leaves of plants from the Great Basin to be more glandular than for those in the main body of distribution in the Colorado drainage system.

***Machaeranthera tanacetifolia* (H.B.K.) Nees** [*Aster tanacetifolius* H.B.K.]. Annual (winter annual) herbs; stems 8–50 cm tall, glandular-puberulent and more or less villous; leaves 1–6 cm long, 1- or 2-pinnatifid, the segments ending in spinulose bristles; heads 1 to many, in corymbose clusters; involucre 8–12 mm high, 10–18 mm wide, hemispheric; bracts lance-linear, attenuate,

chartaceous basally, green apically, spreading, the reflexed tips glandular; rays 11–23 (36), pink- or blue-purple, 11–14 mm long; pappus off-white; achenes ca 2.5 mm long, pilose. Mixed desert shrub, salt desert shrub, and pinyon-juniper communities at 1125 to 1830 m in Emery, Garfield, Grand, Juab, Kane, San Juan, Sevier, Utah, Wasatch, Washington, and Wayne counties; 31 (vi). The plants are somewhat weedy, colonizing disturbed sandy and silty soils. The similar *M. parviflora* Gray [*Aster parvulus* Blake] is reported for Utah by various authors. It differs in having once-pinnatifid leaves, involucre 4–6 mm long, and rays 5–7 mm long. No material has been seen from Utah by me.

#### MADIA Molina

Annual or biennial tar-scented herbs from taproots; leaves opposite below, alternate above, simple, entire; heads radiate, the rays pistillate, fertile, yellow, or inconspicuous; involucre bracts uniseriate, equal, enfolding the ray achenes; receptacle flat or convex, with a single series of bracts between the ray and disk flowers; disk flowers perfect; pappus none, a short crown, or a few scales; achenes finely striate, commonly incurved, compressed.

1. Heads turbinate-ovoid, 6–12 mm wide (when pressed); rays 4–7 mm long, showy ..... *M. gracilis*
- Heads ellipsoid, 2–5 mm wide (when pressed); rays to 2.5 mm long, or lacking ..... *M. glomerata*

***Madia glomerata* Hook.** Tarweed. Annual herbs; stems mainly 8–40 (60) cm tall; herbage strigose and with long setiform multicellular hairs on leaf bases and on stems above, and stipitate-glandular upward, malodorous; leaves 1.2–9 cm long, 1.5–7 mm wide, linear; heads in dense terminal clusters or sometimes open; involucre 5.5–9 mm high, 2–5 mm wide; rays inconspicuous,

mostly 1.5–2.5 mm long, yellow or purplish; disk flowers 1–10; achenes 5-nerved, glabrous. Sagebrush, mountain brush, aspen, spruce-fir, grass-forb, and alpine meadow communities at 1830 to 3175 m in Cache, Carbon, Davis, Duchesne, Emery, Iron, Juab, Piute, Salt Lake, Sanpete, Sevier, Summit, Tooele, Utah, Wasatch, Washington, and Weber counties; Alaska to Saskatchewan,



south to California, Arizona, and Colorado; 38 (iv).

*Madia gracilis* (Smith) Keck [*Sclerocarpus gracilis* Smith in Rees]. Annual herbs; stems mainly 10–60 (100) cm tall; herbage pilosulose, becoming hirsute with long multicellular hairs upward, stipitate-glandular with dark capitate glands on the peduncles and sepals; leaves 1–10 cm long, 2–7 (10) mm wide, linear to elliptic or oblong; heads several to many in an open corymbose cluster; involucre 6–11 mm high, 6–12 mm wide; rays conspicuous 5–13, yellow, 4–7 mm long; disk flowers 15–35; achenes often mottled. Opening in mountain brush community at ca 1925 m in Salt Lake County; British Columbia to Montana, south to California; 1 (0).

MALACOTHRIX DC.

Annual (winter annual) or perennial herbs from taproots with milky juice; leaves alternate or mainly basal, mostly pinnatifid; heads of ray flowers only, long-peduncled, solitary or few to several and more or less corymbose; flowers yellow; involucre campanulate; bracts subequal in 2–4 series, with a few short outer ones; receptacle flat, setose or naked; rays 5-lobed; pappus of capillary bristles, these more or less united at the base and falling together or with some persistent; achenes columnar, glabrous, 10- to 15-ribbed, crowned or denticulate at the summit.

WILLIAMS, E. W. 1957. The genus *Malacothrix* (Compositae). Amer. Midl. Naturalist 58:494–512.

- 1. Leaves merely dentate, elliptic to oblong or lanceolate, the cauline ones clasping basally; involucre bracts orbicular to ovate and with broad scarious margins ..... *M. coulteri*
- Leaves pinnatifid or incised to pinnately lobed, the cauline ones not especially clasping; involucre bracts linear to narrowly lanceolate ..... 2
- 2(1). Leaves linear-filiform or pinnately dissected into linear segments ..... *M. glabrata*
- Leaves with triangular to oblong lobes or teeth, these sometimes attenuate but not linear ..... 3
- 3(2). Involucre longer than broad (when pressed); persistent pappus setae 1 or 2; stems decidedly tapering upward; plants rare, in Washington County . *M. clevelandii*
- Involucre broader than long (when pressed); persistent pappus setae 1–5 or lacking; stems various ..... 4
- 4(3). Leaves with lateral lobes regularly toothed; involucre mainly less than 10 mm long; achenes 2–2.8 mm long; pappus bristles all deciduous ..... *M. sonchoides*
- Leaves with lateral lobes irregularly toothed or lobed; involucre more than 10 mm long; achenes 3–4 mm long; pappus often with 1 or few persistent bristles ..... *M. torreyi*

*Malacothrix clevelandii* Gray Cleveland Malacothrix. Annual herbs; stems mainly 10–40 cm tall, often branched, glabrous, commonly reddish; leaves basal and cauline, 1–10 cm long, 5–15 mm wide, oblanceolate to elliptic, pinnately lobed or merely toothed; heads few to many in a subcorymbose cluster; involucre campanulate, 6–7 mm high; main involucre bracts linear, glabrous, green, the tips often purple, the margins narrowly scarious; rays yellow, ca 2–3 mm long; pappus deciduous or with 1 or 2 persistent bristles; achenes ca 2 mm long, slender, striate. Pinyon-juniper and live oak communities at ca 1375 m in Washington

County; California, Nevada, and Arizona; 2 (0).

*Malacothrix coulteri* Harv. & Gray in Gray Snakeshead Malacothrix. Annual (winter annual) herbs; stems mainly 10–50 cm tall, often branched, glabrous and straw colored to whitish tan; leaves basal and cauline 1.2–10 cm long, oblong to oblanceolate or lanceolate, the cauline ones clasping basally; heads few to several, corymbose; involucre hemispherical, 10–15 mm high; bracts imbricate, suborbicular to ovate, with broad scarious margins, the midline broad, purplish; rays yellow to off-white, 5–18 mm long; pappus with 1–4 persistent bristles; achenes

2–2.8 mm long, striate. Warm desert shrub community at ca 950 m in Washington County (Galway sn BRY); Arizona and California; 2 (0).

***Malacothrix glabrata* (D.C. Eaton) Gray** [*M. californica* var. *glabrata* D.C. Eaton]. Annual (winter-annual) or biennial herbs; stems mainly 10–60 cm tall, often branched from the base and above, glabrous; leaves basal and cauline, 0.5–15 cm long, pinnately lobed, glabrous or more or less villous, with rachis and lobes linear to linear-filiform, the cauline ones similar to the basal except reduced upward; head solitary or more commonly few to many and subcorymbosely arranged; involucre broadly campanulate 10–14 mm high, the main bracts linear to narrowly oblong, with narrow hyaline margins, glabrous, the outer bracts commonly more or less villous; rays yellow, 10–20 mm long; pappus with usually 2 persistent bristles; achenes 2–3 mm long, striate. Joshua tree, blackbrush, Vanclevea-ephedra, and pinyon-juniper communities at 700 to 1525 m in Kane, Millard, San Juan, and Washington counties; Oregon to Idaho, south to California and Arizona; 22 (0).

***Malacothrix sonchoides* (Nutt.) T. & G.** [*Leptoseris sonchoides* Nutt.]. Annual or winter annual herbs; stems mainly 6–37 cm tall, often branched from the base and above, glabrous or with short yellowish glandular hairs in the inflorescence; leaves basal and cauline, 0.7–12 cm long, 1–28 mm wide, the basal ones at least pinnatifid and the lobes regularly toothed; heads solitary or more commonly few to many and subcorymbosely arranged; involucre campanulate 7.5–10.2 mm high, 6.5–12 (14) mm wide, the main bracts lance-oblong to linear, with narrowly hyaline margins, glabrous, the outer sometimes with yellowish stipitate glands; rays yellow, 7–12 mm long; pappus bristles all deciduous; achenes 2–2.8 mm long, striate. Blackbrush, krameria-psorothamnus, mixed desert shrub, sagebrush, and pinyon-juniper communities at 915 to 1856 m in Beaver, Duchesne, Emery, Garfield, Grand, Juab, Kane, Millard, San Juan, Tooele, Uintah, Washington, and Wayne counties; California and Nevada, east to Nebraska and New Mexico; 72 (vi).

***Malacothrix torreyi* Gray** [*M. sonchoides* var. *torreyi* (Gray) Williams]. Annual or winter annual herbs; stems mainly 8–29 cm tall, often branched from the base and above, glabrous, or with yellowish stipitate glands in the inflorescence; leaves basal and cauline, 1.7–9.5 cm long, 5–27 mm wide, the basal ones at least pinnatifid, and the lobes irregularly toothed or lobed, often more or less white villous; heads solitary, or more commonly few to several or many and subcorymbosely arranged; involucre broadly campanulate, 10.5–15 mm high, 12–21 mm wide, the main bracts lance-linear, with hyaline margins, glabrous or some with stipitate yellowish glands, the outer bracts often stipitate-glandular; rays yellow, 10–14 mm long; pappus all deciduous or with 1–5 persistent setae; achenes 3–4 mm long, striate. Shadscale, greasewood, other salt desert shrub, and mixed desert shrub communities at 1460 to 1925 m in Beaver, Box Elder, Carbon, Duchesne, Emery, Garfield, Grand, Juab, Millard, Piute, Salt Lake, Sevier, Tooele (type from Great Salt Lake), and Uintah counties; Oregon to Wyoming, south to California and Arizona; 28 (i).

#### MATRICARIA L.

Biennial or perennial herbs; leaves alternate, 2- to 3-pinnatisect, with ultimate segments linear-filiform; heads radiate, few to many in corymbose clusters; involucre broadly campanulate, the bracts in several series, the margins scarious; receptacle hemispheric, solid, naked; rays pistillate, white; disk flowers 5-lobed, perfect, yellow; pappus a small crown; achenes laterally compressed, with 3 smooth ribs on the ventral surface and 1 or 2 (rarely more) resin glands at the apex of the dorsal face. **Note:** Tentatively I have chosen to follow authors of *Flora Europaea* (Vol. 4) in segregating *Chamomilla* (q.v.) from *Matricaria*. The genera are much alike and are separated mainly on technical characteristics that are discernible only when fruit is mature.

***Matricaria maritima* L.** Biennial or, less commonly, perennial, essentially unscented herbs; stems 1–6 dm tall, glabrous or nearly so; leaves 1–8 cm long, the ultimate segments long and slender; heads several to many, the

disk 8–15 mm wide; rays 10–25, white, 6–13 mm long. Ruderal weed of moist sites at 1830 to 2135 m in Salt Lake, Sanpete, and Sevier counties; widespread in North America; adventive from Europe; 2 (i).

MICROSERIS D. Don

Annual or perennial, scapose or caulescent taprooted herbs with milky juice; leaves al-

ternate or all basal, entire or pinnatifid; heads many flowered, erect or nodding in bud; involucre cylindric to campanulate, the innermost bracts lance-attenuate, subequal, the outer ones shorter and imbricate; receptacle naked; corollas all raylike, showy, yellow to yellow-orange (fading bluish); pappus of awn-tipped scales or of plumose capillary bristles; achenes columnar to fusiform, not or only short beaked, ca 10-ribbed.

1. Plants annual; pappus of 5 scales, entended into scabrous bristles apically .....  
..... *M. lindleyi*
- Plants perennial; pappus of numerous plumose capillary bristles arising from short scales ..... *M. nutans*

*Microseris lindleyi* (DC.) Gray [*Calais lindleyi* DC.; *Microseris linearifolia* (Nutt.) Schultz-Bip; *Uropappus linearifolius* Nutt.]. Annual herbs from slender taproots; herbage puberulent or glabrate; stems lacking or more or less developed, the scapose peduncles 10–25 cm high; leaves 6–15 (30) cm long, pinnately lobed to entire, linear to narrowly elliptic; heads many flowered, erect, the main bracts lance-attenuate, 15–30 mm long, subequal, the outer ones shorter and unequal; rays yellow (drying blue); pappus 10–20 mm long, silvery, deciduous, of 5 lance-linear scales, each terminating in a scabrous awn from a bifid apex; achenes dark brown, 9–13 mm long, tapering apically, scabrous on the ribs. Blackbrush, creosote bush, and pinyon-juniper communities at 915 to 1375 m in Washington County; Washington to Idaho, south to Baja California and Arizona; 5 (i).

*Microseris nutans* (Geyer) Schultz-Bip [*Scorzonella nutans* Geyer]. Perennial herbs from tuberous roots; herbage glabrous or sparsely scurfy; stems more or less developed, the scapose peduncles mainly 12–40 (60) cm high, pinnately lobed to entire, linear to elliptic, lanceolate, or oblanceolate; heads soli-

tary or 2–5, many flowered, nodding in bud, the main bracts 10–20 mm long, lance-attenuate, subequal, the outer bracts shorter and unequal; rays yellow (drying lavender or blue); pappus of numerous narrow scales, each with a plumose terminal bristle. Sagebrush, pinyon-juniper, mountain brush, Douglas fir, and aspen communities at 1675 to 2745 m in Box Elder, Cache, Daggett, Davis, Juab, Millard, Rich, Salt Lake, Sanpete, Sevier, Summit, Uintah, Utah, and Weber counties; British Columbia to Montana, south to California, Nevada, and Colorado; 33 (ii).

MONOPTILON T. & G. ex Gray

Annual herbs, branched from base, the herbage hispid; leaves alternate, spatulate, entire; heads radiate, solitary on branch tips, closely subtended by upper leaves; involucre campanulate, the bracts subequal, linear, herbaceous; receptacle flat, naked; ray flowers pistillate, white to pink; disk flowers perfect, fertile, yellow (purplish); pappus of a short scarious cup and 1 apically plumose bristle, or of numerous bristles alternating with short scales; achenes compressed, marginally nerved, pubescent.

1. Pappus of usually several nonplumose bristles alternating with scales; disk corollas sparsely if at all pilose; reported for Utah by Abrams and Ferris (Illustrated Flora of the Pacific States), but not seen by me . *M. belliioides* (Gray) Hall
- Pappus consisting of minute scales and a single apically plumose bristle; disk corollas densely pilose below ..... *M. bellidiforme*

*Monoptilon bellidiforme* T. & G. in Gray Depressed annual branching herbs; stems 1–5

cm high; leaves 4–10 mm long, 0.5–2.5 mm wide, narrowly oblanceolate; heads showy;



involucres 4–5 mm high; bracts linear, attenuate or acuminate, hirsute, and minutely glandular; rays 12–20, ca 4–5 mm long, the tube pilose; pappus of 1 apically plumose bristle and several shorter scales, or the pappus rarely lacking; achenes ca 2 mm long. Warm desert shrub at 700 to 900 m in Washington County; California, Nevada, and Arizona; 2 (0).

#### ONOPARDUM L.

Biennial caulescent spiny herbs from taproots, the juice watery; leaves basal and cauline, alternate, winged-decurrent; heads solitary or few to several; involucre bracts in several series, imbricate, spine tipped; receptacle flat, fleshy, honeycombed, often with short bristles on the partitions, not densely bristly; corollas all discoid, reddish purple or pink, perfect; pappus bristles barbellate; achenes glabrous, subquadrangular, 4- or 5-ribbed.

*Onopardum acanthium* L. Biennial herbs; stems mainly 5–15 (30) dm tall; leaves of basal rosettes 5–50 cm long or more and 2–15 cm wide, pinnately lobed and serrate-dentate, tomentose on both surfaces, but less so above, spinose; cauline leaves pinnatifid, tomentose to glabrate, strongly winged-decurrent along the stem length; involucre 25–35 mm high, 30–65 mm wide, the bracts lance-attenuate, with spreading spine tips, tomentose to glabrate marginally, the inner erect; spines 3–5 mm long, yellowish; corollas reddish purple to pink. Ruderal weeds at low elevations in Millard, Tooele, Utah, Wasatch, and Washington counties; adventive from Europe; 6 (ii). This handsome but troublesome thistle is spreading through the state, but less vigorously than the musk thistle, *Carduus nutans* (q.v.).

#### OXYTENIA Nutt.

Perennial riparian herbs from a ligneous caudex; leaves alternate, pinnately divided or some entire, the segments linear-filiform, involute; heads discoid, numerous, in elongate paniculate inflorescences; marginal flowers 5, pistillate, inner flowers 10–30, staminate; flowers yellowish white; involucre bracts 5, orbicular, mucronate; receptacle chaffy, the chaffy bracts slender, with dilated villous

tips; pappus lacking; achenes obovoid, densely villous, 1-ridged on each face.

*Oxytenia acerosa* Nutt. Copperweed. Perennial herbs; stems erect, mainly 5–12 dm tall, broomlike in the inflorescence, striate; leaves 3–15 cm long, pinnately 3- to 7-lobed, or the upper ones simple; herbage strigulose; heads 3–4 mm wide, erect or ascending; involucre bracts herbaceous, strigulose; achenes 1.5–2 mm long, black, long villous-pilose. Saline riparian areas and near seeps and springs at 1220 to 2135 m in Carbon, Emery, Garfield, Grand, Kane, San Juan, and Washington counties; Colorado, New Mexico, Arizona, Nevada, and California; 25 (vii). Copperweed is poisonous to livestock.

#### PALAFoxia Lag.

Annual herbs; leaves alternate, entire; heads discoid, few to several, corymbose or paniculate; involucre cylindric; bracts in 1 series, herbaceous; receptacle flat, naked; flowers white, all alike or the outer with unequal lobes; pappus scales 4–8, slender, unequal, with a strong nerve; achenes linear, quadrangular.

*Palafoxia linearis* (Cav.) Lag. Spanish Needle. [*Ageratum lineare* Cav.]. Annual herbs; herbage hispid with slender multicellular hairs, glandular upward; stems commonly branched above the base, 1–7 dm tall; leaves petiolate, the blades 1–7.5 cm long, 2–8 mm wide, linear-lanceolate, long-attenuate; involucre 12–18 mm high, glandular, and more or less hispid, 10- to 20-flowered, the corollas white with pink exerted styles; pappus scales usually 4; achenes strigose. Warm desert shrub community at 700 to 1000 m in Washington County; California to Arizona and Mexico; 5 (0).

#### PARTHENIUM L.

Herbs or shrubs; leaves alternate, entire or lobed; heads solitary or few and more or less clustered, inconspicuously radiate; ray flowers 5, white, pistillate, fertile, persistent; disk flowers staminate; receptacle plano-convex, chaffy throughout; pappus of 2 or 3 awns or scales; ray achenes dorsiventrally compressed, rotund in outline, the margins thickened into riblike structures attached to the

contiguous pair of infertile disk flowers and the subtending bract, the achene, the 2 attached flowers, and the bract falling as a unit.

ROLLINS, R. C. 1950. The guayule rubber plant and its relatives. Contr. Gray. Herb. 179: 1-73.

1. Plants shrubs, the internodes apparent; heads seldom solitary; known from Washington County ..... *P. incanum*
- Plants pulvinate-caespitose herbs, the internodes not apparent; heads solitary; plants of eastern Utah ..... *P. ligulatum*

*Parthenium incanum* H.B.K. Aromatic shrub, 4-10 dm tall, much branched, the branchlets loosely tomentose, becoming glabrate; leaves short-petioled, the blades 0.5-5 cm long, 0.4-1.5 cm wide, lobed, white-tomentose below, less so above; heads several to many, corymbose, 3-5 mm wide, outer involucrel bracts oblong, acute, villous, the inner ones suborbicular, membranous; rays white, emarginate to incised, 1-2 mm long; pappus of 2 or more pubescent awns; achenes black, oblanceolate, 1.5-2 mm long, pubescent on the ventral surface. Limestone cliffs in creosote bush-blackbrush community at ca 1220 m in Washington County (Higgins 4102 BRY); Arizona to Texas, south to Mexico; 1 (0).

*Parthenium ligulatum* (Jones) Barneby [*P. alpinum* var. *ligulatum* Jones, type from Theodore (Duchesne); *Bolophyta ligulata* (Jones) W.A. Weber]. Pulvinate caespitose to merely caespitose acaulescent mound-forming herbs to ca 3 cm high, from a taproot and branched caudex, the caudex branches densely clothed with brownish marcescent leaf bases and often with ashy leaves of the previous year; leaves 3-20 mm long, 1.5-4 mm wide, spatulate to oblanceolate, strigose; heads solitary at branch ends, sessile, 5-7 mm high, 4.5-6 mm wide; outer bracts oblong, densely pubescent apically; pappus scales distinct or adnate to the corolla tube; rays white, 1-2 mm long, emarginate; achenes oblanceolate, densely hairy, 4-5 mm long, 2-3 mm wide. Barren or semibarren calciferous or gypsiferous outcrops of the Green River, Uinta, Ferron, and Carmel formations in salt desert shrub and pinyon-juniper communities at 1705 to 2135 m in Daggett, Duchesne, Emery, and Uintah counties; Colorado (a Colorado Plateau endemic); 42 (iv). This amazing plant is one of a series of edaphically restricted mound-formers in semibarren habits on shales and clays of arid sites in Utah. It belongs to a closely related assem-

blage of two or three taxa within section *Bolophytum*, and has been regarded at specific status within the segregate genus *Bolophyta*. Its phylogenetic position was reviewed by Rollins (1950), and its status within *Parthenium* seems to represent best its generic affinities.

PECTIS L.

Annual herbs; leaves opposite, entire, glandular-dotted; heads radiate, few to several in cymose clusters; involucre turbinate to subcylindric; bracts 3-12 in one series, expanded basally, enclosing the ray flowers, often with translucent glands; receptacle naked; ray flowers perfect, yellow; disk flowers few; anthers entire, obtuse at base; style branches short, hispidulous; pappus of short-plumose bristles on disk flowers, that of ray flowers a short crown of united scales; achenes terete.

*Pectis papposa* Harv. & Gray in Gray Chinch-weed. Annual herbs; stems dichotomously branched, often decumbent-spreading, 5-20 (25) cm long, the herbage yellowish green; leaves 6-40 (60) mm long, 0.5-2 mm wide, with a few setae at the base, glabrous, bearing oval to elliptic large yellowish glands; heads on peduncles mainly 0.3-1 (2) cm long; involucre gibbous at the base, rounded dorsally, sparingly glandular like the leaves; ray flowers yellow, 7-9, ca 4-6 mm long; achenes 4-5 mm long, stipitate-glandular. Sandy soil in warm and sandy desert shrub communities at 850 to 1650 m in Kane, San Juan, and Washington counties; California to New Mexico, and south to Mexico; 9 (i).

PEREZIA Lag.

Perennial herbs from a caudex, this clothed with rusty woolly hairs; leaves alternate, simple, clasping; heads numerous in corymbose cymes, apparently discoid; involucre

campanulate, strongly imbricate; flowers perfect, pink to pink-purple, the corollas bilabiate, the outer lip 3-toothed, the inner lip recurved, 2-toothed; anthers appendaged; style branches flattened, truncate apically; pappus of white capillary bristles; achenes subterete, minutely glandular.

*Perezia wrightii* Gray [*Acourtia wrightii* (Gray) Reveal & King]. Perennial herbs; stems 4-6 (10) dm tall, often purplish at the base, the rusty hairs at stem base copious; leaves lance-oblong to ovate or lanceolate, spinulose-dentate, glandular-puberulent on both sides, the lower ones petiolate, becoming sessile and clasping upward; involucre 5-8 mm high and about as broad, the bracts graduated, the outer ones ovate, the inner lance-oblong, obtuse, green, the margins often purplish, ciliate; corollas pink to pink-purple; achenes 4.8-5.2 mm long. Warm desert shrub and juniper communities at 915 to 1525 m in Kane, San Juan, and Washing-

ton counties; Arizona to Texas, south to Mexico; 6 (i).

PERITYLE Benth.

Annual herbs or perennial subshrubs; leaves mostly opposite below, alternate above, simple, petiolate; heads few to numerous, corymbose, radiate or discoid; involucre hemispheric or turbinate, the bracts somewhat keeled, in 1 or 2 subequal series; receptacle flat, naked; ray flowers (when present) pistillate, white or yellow; disk flowers perfect; anthers subtire to auriculate at the base; style branches linear or subulate; achenes flattened; pappus of scales, or of 1 or 2 awnlike bristles, or lacking.

POWELL, A. M. 1973. Taxonomy of *Perityle* section *Laphamia* (Compositae-Helenieae-Peritylinae). *Sida* 5: 61-128.

———. 1974. Taxonomy of *Perityle* section *Perityle* (Compositae-Peritylinae). *Rhodora* 76: 229-305.

- 1. Plants annual ..... *P. emoryi*
- Plants subshrubs ..... 2
- 2(1). Heads radiate; plants glandular-hispidulous, of the Great Basin ..... *P. stansburyi*
- Heads discoid; plants villous or glandular-hispidulous, of the Colorado or Virgin drainages ..... 3
- 3(2). Herbage short-villous and more or less glandular; pappus bristles 1; plants of Washington County ..... *P. tenella*
- Herbage hispidulous; pappus of 3 (4) unequal bristles; plants of Grand County ..... *P. specuicola*

*Perityle emoryi* Torr. in Emory Emory Rock-daisy. Annual herbs, mainly 2-5 dm tall; stems erect or spreading, commonly branched above, puberulent; leaves mostly alternate, petiolate, the bases 0.5-4 cm long, 0.6-3 (5) cm wide, ovate, cordate, or suborbicular, toothed, lobed, cleft, or divided, the lobes again toothed or lobed, hirsute to glandular-pubescent; heads radiate; involucre 5-6 mm high and usually broader; rays 8-12, white, 1.5-5 mm long; disk flowers numerous; pappus vestigial or a crown of scales and 1 slender bristle; achenes 2-3 mm long, the flattened faces nearly glabrous, the margin thickened and bearing short stiff hairs. Sand sagebrush community at lower elevations in Washington County (Tanner sn 1941 BRY); Nevada, California, Arizona, and Mexico; 1 (0).

*Perityle specuicola* Welsh & Neese Alcove Rock-daisy. Perennial suffrutescent herbs, mainly 50-75 cm tall; stems sprawling or pendulous, much branched; herbage glandular-hispidulose; leaves mostly alternate, short-petiolate, the blades 3-6 mm long, 1.5-3 mm wide, ovate-elliptic, entire, hispidulous; heads few to many in a branching corymbose inflorescence; involucre 3.5-5 mm high, 5-6 mm wide; bracts 11-16, oblong to elliptic, keeled; ray flowers lacking; disk flowers numerous, ca 2.5 mm long, whitish (?); pappus of 3 unequal scabrous bristles and often with 1 apically flattened and sigmoid scale; achenes 3-3.8 mm long, the faces flattened, glabrous, the margin thickened and with short ascending hairs. Hanging garden communities at ca 1220 m in Grand County; endemic; 2 (ii).



*Perityle stansburyi* (Gray) Macbride  
Stansbury Rock-daisy. [*Laphamia stansburyi* Gray, type from Stansbury Island]. Suffrutescent perennials, clump-forming, 7–30 cm tall and as broad or more; herbage glandular-hirtellous; leaves mainly alternate, the blades 3–14 mm long, 1.5–12 mm wide, broadly ovate to deltoid or orbicular, typically few to several lobed; petioles 1–14 mm long; heads few to many in a branching corymbose inflorescence; involucre 5–6.5 mm high, 5–10 mm wide; bracts 16–21, lanceolate to oblanceolate, strongly keeled; ray flowers 10–14, yellow, 3–5.5 mm long; disk flowers numerous, yellow, 4–5 mm long; pappus of 1 stout bristle and a very short crown of hyaline scales; achenes 2.3–3.5 mm long, with thin callous margins, short-pubescent on margins and on faces. Limestone, dolomite, and igneous ignimbrite (ashflow tuff) outcrops, in mixed desert shrub, pinyon-juniper, and mountain brush communities, at 1280 to 1895 m in Beaver, Juab, Millard, Salt Lake, Sanpete, Sevier, and Juab counties; Nevada (a Great Basin endemic); 39 (v).

*Perityle tenella* (Jones) Macbride Jones  
Rock-daisy. [*Laphamia palmeri* Gray, type from Beaverdam, Arizona?, not *P. palmeri* Wats.; *L. palmeri* var. *tenella* Jones, type from Springdale]. Suffrutescent perennials, clump-forming, 9–25 cm tall and as broad or more; herbage villous and glandular; leaves mainly alternate, the blades 4–13 mm long, 3–15 mm wide, deltoid-ovate, the base obtuse to truncate or cordate; petioles 1–8 mm long; heads solitary or few to many, corymbose; involucre 4–6.5 mm long, 5–10 mm wide; bracts 11–18, lance-elliptic, keeled; ray flowers absent; disk flowers numerous, yellow, 3–4 mm long; pappus of a single bristle; achenes 2.5–3 mm long, with thin callous margins, short-pubescent on margins and on faces. Joshua tree, creosote bush, blackbrush, warm desert shrub, pinyon-juniper, and ponderosa pine communities at 915 to 2135 m in Washington County; Arizona; a Mohave endemic; 7 (0). Plants from the Beaverdam Mountains have heads that average larger, but they seem not to differ otherwise from the typical materials taken near Zion National Park.

## PETRADORIA Greene

Suffrutescent perennials from a taproot and woody caudex; stems herbaceous, leafy; leaves basal and cauline, alternate, entire, 3- to 5-veined, coriaceous; heads radiate (in ours), congested at branch ends in an open corymbose inflorescence; involucre cylindrical; bracts in several series, in more or less vertical ranks; flowers 4–7, yellow, the corollas glabrous; pappus of brownish capillary bristles; achenes somewhat compressed, glabrous.

ANDERSON, L. C. 1964. Studies on *Petradoria* (Compositae); anatomy, cytology, taxonomy. Trans. Kansas Acad. Sci. 66: 632–684.

*Petradoria pumila* (Nutt.) Greene  
Rock Goldenrod. [*Chrysoma pumila* Nutt.]. Plants from a well-developed caudex, the caudex branches clothed with dark to ashy or tan marcescent leaf bases; leaves 1.5–12 cm long, 1–11 mm wide, oblanceolate to lanceolate, elliptic, or linear; cauline leaves reduced upward; heads numerous; involucre 5–9.5 mm high, 1.3–2.8 mm wide; involucral bracts 10–21, in 3–6 series, more or less keeled; flowers 2–8, the rays 1–3, yellow, 4–9 mm long; achenes 4–5 mm long, glabrous, 6- to 9-nerved. Shadscale, mixed desert shrub, pinyon-juniper, sagebrush, and ponderosa pine communities at 1525 to 3050 m in all (?) Utah counties; Idaho and Wyoming, south to Nevada, California, Arizona, and New Mexico; 100 (xv). Most of our specimens belong to the broad-leaved var. *pumila*, but one specimen from Emery County (Harris 546 BRY) seems to be clearly allied to var. *graminea* (Woot. & Standl.) Welsh comb nov. [based on: *Petradoria graminea* Woot. & Standl. Contr. U.S. Natl. Herb. 16: 183. 1913; ssp. *graminea* (Woot. & Standl.) L.C. Anderson]. That taxon has been known previously only from Arizona.

## PLATYSCHKUHRIA (Gray) Rydb.

Perennial herbs from a woody caudex and rootstock; leaves alternate, simple, coriaceous, often impressed-punctate; heads few to many in a cymose paniculate cluster, radiate, campanulate to hemispheric; involucral bracts subequal in 2 series; receptacle essentially flat, naked; rays pistillate,

fertile, yellow; disk flowers numerous, perfect; anthers more or less sagittate basally; pappus of 8–16 scales with midribs sometimes produced apically; achenes narrowly obpyramidal and 4-sided, hairy or glabrous on the sides.

ELLISON, W. L. 1971. Taxonomy of *Platyschkuhria* (Compositae). *Brittonia* 23: 269–279.

*Platyschkuhria integrifolia* (Gray) Rydb. [*Schkuhria integrifolia* Gray; *Bahia nudicaulis* Gray; *B. integrifolia* (Gray) Macbride].

Perennial herbs; stems solitary or few to several, mainly 12–55 cm tall; herbage white-strigulose or stipitate-glandular, especially above; main leaves near the stem base, petiolate, the blades 1.5–9.5 cm long, 0.5–4 cm wide, ovate to lanceolate, elliptic, or oblanceolate; cauline leaves reduced upward, finally merely bracteate; heads (1) 2–10; rays 7–11, yellow, 6–14 mm long; achenes 5–8 mm long. Three rather distinctive varieties are present in eastern Utah, as indicated below.

1. Stems leafy almost or quite to the apex; plants of San Juan County ..... *P. integrifolia* var. *oblongifolia*
- Stems leafy mainly below the middle; plants not known from San Juan County ..... 2
- 2(1). Pubescence of upper stems merely white-strigulose; involucre bracts caudate-attenuate ..... *P. integrifolia* var. *ourolepis*
- Pubescence of upper stems stipitate-glandular; involucre bracts mainly obtuse to acute ..... *P. integrifolia* var. *desertorum*

**Var. *desertorum* (Jones) Ellison** [*Bahia desertorum* Jones, type from Cisco]. Salt desert shrub, pinyon-juniper, and mountain brush communities, mainly in saline substrates, at 1280 to 2565 m in Carbon, Duchesne, Emery, Garfield, Grand, Sevier, Uintah, and Wayne counties; Colorado; a Colorado Plateau endemic. A report by Ellison (1971) of var. *integrifolia* (a Wyoming-Montana endemic) belongs here; 39 (xi). The var. *desertorum* is closely allied with var. *integrifolia*, as indicated by pubescence and bract shape similarities. This variety is transitional with var. *ourolepis*.

**Var. *oblongifolia* (Gray) Ellison** [*Schkuhria integrifolia* var. *oblongifolia* Gray; *Bahia oblongifolia* (Gray) Gray; *Platyschkuhria oblongifolia* (Gray) Rydb.]. Desert shrub communities in San Juan County; Arizona, Colorado, New Mexico; 0 (0). The variety is reported from San Juan County, but no specimens have been seen by me.

**Var. *ourolepis* (Blake) Ellison** [*Bahia ourolepis* Blake, type from Green River]. Salt desert shrub and pinyon-juniper communities at 1280 to 1830 m in Duchesne, Emery, Grand, and Uintah counties; endemic; 24 (iii). The main body of this variety lies in Uintah County.

#### PLUCHEA Cass.

Shrubs; leaves alternate, simple, entire, sericeous; heads discoid, few to several, aggregated in terminal cymose clusters; involucre campanulate; bracts imbricate in several series, scarious, the outer ones sericeous; receptacle flat or concave, naked; outer flowers pistillate, numerous, their filiform corollas 3- or 4-toothed; central flowers perfect but the innermost sterile, their tubular corollas 5-toothed; anthers sagittate basally; pappus of outer flowers merely capillary bristles, those of inner flowers clavate apically.

***Pluchea sericea* (Nutt.) Cov.** Arrowweed. [*Polypappus sericeus* Nutt.; *Tessaria sericea* (Nutt.) Shinnars]. Shrubs with slender, erect, willowlike branches, mainly 0.8–3 m tall, sericeous throughout, longitudinally striate; leaves 0.8–4.5 cm long, 2–9 mm wide, elliptic to narrowly lanceolate or lanceolate, entire, sessile; heads more or less conspicuous; involucre 3.5–5 mm high, 4–7 mm wide; outer bracts ovate to ovate-lanceolate, abruptly acute, deciduous, often purplish; pistillate flowers purplish, numerous; perfect flowers purplish, fewer; achenes glabrous; pappus bristles of perfect flowers dilated apically. Riparian areas at 460 to 1220 m in Garfield, Kane, San Juan (?), and Washington

counties; California to Texas, south to Mexico; 22 (iii). The genus *Pluchea*, in a broad sense, includes annual and perennial herbs and shrubs. *Tessaria*, when segregated from *Pluchea*, consists of the shrubby species that have dimorphic corollas and the inner perfect flowers with apically flared pappus bristles. The residue within *Pluchea* contains only herbs with uniformly 4-lobed corollas and pappus of uniform barbellate capillary bristles. I follow tradition in maintaining our species in *Pluchea*.

POROPHYLLUM (Vaill.) Adans.

Suffrutescent perennial; leaves alternate or opposite, simple, with at least some elliptic to oval oil glands; heads discoid, solitary, or few to several in corymbose clusters; involucre cylindric, the bracts usually 5, in subequal series, glandular like the leaves; receptacle naked; flowers perfect, fertile, purplish; anthers rounded basally; style branches slender, hirtellous, subulate; pappus of scabrous bristles; achenes slender, striate.

*Porophyllum gracile* Benth. Odora. Rounded bushy perennials from a woody base; stems much branched, 1.5–4 dm tall; herbage dark green or often purplish, glaucous, odoriferous; leaves 1–4 cm long, linear-filiform, entire; involucre subcylindric, 10–15 mm long; bracts 5, dark green, tinged purplish, oblong, the hyaline margin pink, gibbous basally, bearing conspicuous glands, especially apically; corollas purplish, white; pappus bristles pinkish; achenes 8–9 mm long, hispidulous. Desert shrub communities in Washington County (Cottam 5522 UT); California to Arizona and Mexico; 1 (0).

PRENANTHELLA Rydb.

Annual herbs; leaves basal and alternate, simple, pinnately lobed, toothed, or pinnati-

fid; heads small, few to numerous; involucre campanulate; bracts in 2 series, the inner subequal, 3 or 5, the outer much reduced, 1 or 2, herbaceous; flowers all raylike, 4 or 5; achenes 5-ribbed; pappus of white capillary bristles.

*Prenanthes exigua* (Gray) Rydb. [*Prenanthes exigua* Gray; *Lygodesmia exigua* (Gray) Gray]. Annual; stems branched from the base, forming rounded clumps, 7–24 (30) cm tall; inflorescence paniculate, comprising more than half the plant height; lower leaves 1–4 (6.5) cm long, 3–12 (20) mm wide, spatulate to oblanceolate, the rosette often withered at anthesis; cauline leaves reduced upward, finally bracteate scales; herbage sparingly stipitate-glandular; involucre 3–5.5 mm long, 1.2–3.5 mm wide; inner bracts oblong, herbaceous, apically constricted in bud; rays pink or white, 1.5–2 mm long; achenes 3–3.5 mm long, 5-ribbed, scabrous; pappus of white capillary bristles. Blackbrush, creosote bush, other warm desert shrub, salt desert shrub, and pinyon-juniper communities at 850 to 1925 m in Beaver, Carbon, Emery, Garfield, Grand, Juab, Kane, Millard, San Juan, Tooele, Uintah, and Washington counties; California, Nevada, Colorado, Arizona, and New Mexico; 20 (ii).

PSATHYROTES Gray

Annual or perennial (?) herbs; leaves alternate, petiolate, simple, entire or lobed to toothed; heads discoid, the flowers yellow or purplish in age; involucre campanulate; bracts biseriolate, the outer often shorter or otherwise different; receptacle flat, naked; anthers minutely sagittate; style branches flattened; achenes hairy; pappus of capillary bristles.

1. Plants lanate-tomentose as well as scurfy; outer involucral bracts expanded apically, oblong-obovate; reported for Utah by Munz (A California Flora), but not seen by me ..... *P. ramosissima* (Torr.) Gray
- Plants scurfy and less commonly somewhat tomentose; outer involucral bracts tapering apically, lanceolate ..... 2
- 2(1). Leaves entire; herbage scurfy and with long-piliferous multicellular hairs ..... *P. pilifera*
- Leaves toothed; herbage scurfy but not long-piliferous ..... *P. annua*

*Psathyrotes annua* (Nutt.) Gray Mealy Rosettes [*Bulbostylis annua* Nutt.]. Annual or winter annual herbs forming low rounded cushions, mainly 2–18 cm tall; leaves petio-



late, the blades 5–17 mm long, 5–20 mm wide, orbicular to fan shaped, dentate; herbage scurfy; heads few to numerous, corymbose; involucre 5.5–7.5 mm high, 5–8 mm wide; outer bracts lanceolate to oblong, more or less constricted above the middle, scurfy and ciliate; disk corollas 3.5–4.2 mm long, yellow, becoming purplish; achenes 2–2.5 mm long, pilose. Warm desert shrub, salt desert shrub, and pinyon-juniper communities, commonly on limestone and dolomitic gravels, at 790 to 1740 m in Juab, Millard, Tooele, and Washington counties; Idaho south to California, Nevada, and Arizona; 17 (iv).

*Psathyrotes pilifera* Gray Annual or winter annual herbs forming hemispheric cushions, mainly 5–15 cm tall; leaves petiolate, the blades 5–15 mm long, 4–16 mm wide, obovate, ovate, or oval-elliptic, entire; herbage scurfy and piliferous with long multicellular hairs; heads few to many, corymbose; involucre 8.5–10 mm high, 4–5.5 mm wide; outer bracts lanceolate, seldom constricted above the middle, scurfy and with long piliferous setae marginally; disk corollas 6–6.5 mm long, yellow, becoming purplish; achenes 3.8–4.8 mm long. Warm desert shrub and salt desert shrub, commonly on gypsiferous substrates of the Moenkopi and Chinle formations, at 760 to 2260 m in Grand, Kane, and Washington counties; Arizona; endemic; 9 (iii).

PSILOCARPUS Nutt.

Low floccose-woolly annual herbs; leaves opposite, simple, entire; heads discoid, sub-

globose; involucre per se essentially lacking; receptacle chaffy, subglobose; pistillate flowers numerous, imbricate, each enclosed by and deciduous with its subtending bract, woolly, with sides meeting in the center, bearing below the rounded tip on inner side a scarious appendage; corollas filiform; pappus lacking; perfect flowers few, central, ebracteate, the corollas 4- or 5-toothed, epappose; anthers sagittate.

*Psilocarphus brevissimus* Nutt. Low white-woolly annuals; stems simple or with decumbent-prostrate branches mainly 1.5–20 cm long; leaves 5–15 mm long, 1–3 mm wide, spatulate to lanceolate, apiculate; heads solitary or clustered, long-woolly, ca 5–7 mm thick, subtending leaves about as long as the head or longer; pistillate flowers 20–34 or more, the enclosing bracts 2.5–3.2 mm long, woolly, the appendage horizontally produced to erect, ca 0.5 mm long; perfect flowers ca 6–10; achenes subcylindric, terete, 1.3–2 mm long. Lake and reservoir beds at ca 1710 m in Cache and Salt Lake counties; Washington to Montana, south to California, Mexico, and South America; 6 (0).

PSILOSTROPHE DC.

Perennial herbs or shrubs; leaves alternate, simple, entire or merely lobed; heads few to many, corymbose; involucre campanulate; bracts in 1 series, subequal; receptacle naked; ray flowers yellow, pistillate, becoming papery and persistent; disk flowers perfect, 5-lobed; anthers obtuse basally; style branches truncate; pappus of 4–6 hyaline scales; achenes obtusely angled, glabrous or hairy.

- 1. Plants shrubby; stems closely white-tomentose; of Washington County ..... *P. cooperi*
- Plants herbaceous, from a definite caudex; stems glabrous or loosely tomentose; not of Washington County ..... 2
- 2(1). Stems loosely tomentose; involucre densely white villous-tomentose; plants of Grand County ..... *P. bakeri*
- Stems glabrous, or tomentose only at the base; involucre sparingly tomentose, greenish; plants of Wayne, Garfield, and Kane counties ..... *P. sparsiflora*

*Psilostrophe bakeri* Greene Perennial herbs from a caudex; stems 10–35 cm tall, densely white-woolly below, loosely tomentose upward; leaves 0.8–10 cm long, 2–15

mm wide, spatulate to oblanceolate, entire or lobed, pubescent like the stems; cauline leaves reduced upward; involucre loosely villous-tomentose, 5–9 mm high, ca 3–4 mm

wide; rays 3-6, yellow, 6-12 (15) mm long; pappus scales ca 2 mm long, rounded; achenes whitish, ca 2-2.5 mm long. Sandy warm desert shrub community at ca 1285 m in Grand County (Trotter 101 BRY); Colorado (a Plateau endemic?); 1 (0).

*Psilostrophe cooperi* (Gray) Greene Paper-flower. [*Riddellia cooperi* Gray]. Shrubs; stems closely white-tomentose, mainly 30-60 cm tall; leaves 1.2-7 cm long, linear, entire, sparingly tomentose, finally glabrate; involucre tomentose, 6-8 mm high, 5-8 mm wide; rays 4-8, yellow, 8-20 mm long; pappus scales ca 2 mm long, acute; achenes whitish, 4.5-7 mm long. Joshua tree, creosote bush, blackbrush, and pinyon-juniper communities at 915 to 2135 m in Washington County; Nevada, California, Arizona, and New Mexico; 11 (ii).

*Psilostrophe sparsiflora* (Gray) A. Nels. [*Riddellia tagetina* var. *sparsiflora* Gray]. Perennial herbs from a caudex; stems 14-60 cm tall, densely to moderately pilose basally,

sparingly villous-tomentose upward; leaves 0.9-11.5 (14.5) cm long, 1-11 mm wide, spatulate to oblanceolate or linear, pubescent like the stems or glabrate; involucre 4.5-6 mm high, 4-6 mm wide; rays usually 3, yellow, 6-12 mm long; pappus scales 1.5-2.5 mm long, acutish; achenes yellowish, 2.5-3 mm long. Salt desert shrub, pinyon-juniper, and sagebrush communities at 1430 to 2045 m in Garfield, Kane, and Wayne counties; Arizona, New Mexico, and Mexico; 42 (vi).

#### RAFINESQUIA Nutt.

Annual herbs; stems fistulous; leaves alternate, pinnatifid; heads 2 to several, large, showy, with white or rose-tinged flowers; involucre essentially cylindric; bracts 7-15, in 2 series, the inner subequal, the outer ones much shorter, obtuse or subcordate basally; flowers all raylike; pappus white or tawny, of 8-15 slender long-plumose bristles; achenes terete, obscurely few ribbed, attenuate into a beak.

1. Rays mainly 5-8 mm long; achene beak as long as the body; plumose hairs of pappus straight; plants reported for Utah by Munz (A California Flora), but not seen by me ..... *R. californica* Nutt.
- Rays mainly 12-18 mm long; achene beak shorter than the body; plumose hairs of pappus crinkled; plants of Washington County ..... *R. neomexicana*

*Rafinesquia neomexicana* Gray Desert Chicory. Annual (winter annual) herbs; stems mainly 15-40 (50) cm tall, simple or branched, often growing up through shrubs; basal leaves 1.2-9 cm long, pinnatifid, often withered at anthesis; cauline leaves sessile and auriculate-clasping, reduced upward; involucre 15-25 mm high, 5-9 mm wide; main bracts lance-attenuate, the margins scarious, the outer ones more or less cordate basally; rays 12-18 mm long, white or suffused with pink, 5-toothed or -lobed apically; pappus bristles white, the bases flattened, plumose to near the apex; achenes 12-15 mm long, papillate-puberulent. Joshua tree, creosote bush, blackbrush, and desert almond communities at 700 to 1070 m in Washington County; California to Texas and Mexico; 6 (i).

#### RATIBIDA Raf.

Perennial herbs from a caudex and stout taproot; leaves alternate, pinnatifid; heads

radiate, solitary or few and corymbose; rays neuter, commonly yellow (sometimes purple in part or throughout); involucre in 1 series, green; receptacle columnar, chaffy throughout, the bracts more or less clasping the achenes; disk flowers perfect, fertile; anthers sagittate; style branches flattened; achenes compressed at right angles to the involucre bracts, glabrous, the margins sometimes ciliate; pappus of an evident tooth and sometimes with a second one.

*Ratibida columnifera* (Nutt.) Woot. & Standl. Prairie Coneflower. [*Rudbeckia columnifera* Nutt.; *R. columnaris* Pursh]. Perennial herbs; stems mainly 3-6 (12) dm tall, several, often branched above, strigose; leaves 2-9 cm long, pinnatifid, with the terminal division often the largest; heads borne on slender peduncles 6-18 cm long, the disk grayish in bud, purplish brown in flower, 1.5-3 cm long; rays 3-7, yellow (or purple), 1-3 (4.5) cm long, spreading or reflexed; pappus an evident awn tooth on the inner angle

of the achene, often also a shorter one on the outer edge; achenes ciliate and more or less winged on the inner edge. Salt desert shrub and sagebrush communities at 1585 to 2565 m in Garfield, Millard, and Washington counties; British Columbia to Minnesota, south to Arizona, Texas, and Mexico; 4 (i). Our material appears to be adventive from the main body of the species in the prairies and plains provinces to the east of Utah.

RIGIOPAPPUS Gray

Annual herbs; leaves alternate, linear, entire; heads radiate, solitary or few to several, cymose; rays pistillate, fertile, yellow, inconspicuous; involucre campanulate; bracts oblong-alternate, subequal, partly clasping outer achenes; receptacle flat, with a row of bristles between ray and disk flowers; disk flowers perfect, fertile, yellow; anthers not toothed; style branches flattened; pappus usually of 3–5 awnlike scales (or lacking); achenes linear, transversely rugulose.

*Rigiopappus leptocladus* Gray Wireweed. Slender annual herbs; herbage puberulent to

glabrate; stems 2–20 (30) cm tall; lateral branches, when present, very slender, overtopping the early flowers; leaves 0.3–2 (3) cm long, linear, the lower often withered at anthesis; heads small; involucre 4–7 mm high and about as broad; bracts herbaceous, glabrous, thickened dorsally; rays few, yellowish, 1.5–2 mm long; pappus scales linear-subulate, ca 3 mm long; achenes 5–6 mm long. Reported for Utah by Cronquist (Flora of the Pacific Northwest), but not seen by me; 0 (0).

RUDBECKIA L.

Perennial caulescent herbs; leaves alternate, serrate or pinnately to palmately lobed; heads radiate or discoid, the rays (when present) neuter, commonly yellow; involucre bracts in 2 or 3 series, mainly unequal, herbaceous, spreading or reflexed; receptacle conic or columnar, chaffy throughout, the bracts clasping the achenes; disk flowers fertile; anthers obtuse or sagittate basally; style branches flattened; pappus a crown or none; achenes quadrangular or flattened at right angles to the involucre bracts.

- 1. Heads radiate; disks 1–2 cm wide and about as long, little elongate in fruit; plants of San Juan County ..... *R. laciniata*
- Heads discoid; disks 1.5–2.5 cm wide, mostly 2–5 cm long, elongating in fruit; plants not of San Juan County ..... 2
- 2(1). Leaves laciniately lobed; plants glabrous or merely scabrous-ciliate on leaf margins; known from Iron and Washington counties ..... *R. montana*
- Leaves crenate-serrate, dentate, undulate, or entire, not lobed; plants evidently short-hairy to almost glabrous; known from mountains of central northern to south central Utah ..... *R. occidentalis*

*Rudbeckia laciniata* L. Cutleaf Coneflower. Perennial herbs; stems erect from a coarse ligneous base, mainly 5–10 (20) dm tall, glabrous or scabrous-ciliate; leaves petiolate, the blades laciniate-pinnatifid to palmatifid, mainly 4–15 cm long and as broad; heads showy, the disk 1–2 cm wide and about as high; rays yellow, 6–16, deflexed-spreading, 2–5 cm long; pappus a short crown. Moist meadows at 1890 to 2200 m in San Juan County; Montana to Quebec, south to Arizona and Florida; 2 (0).

*Rudbeckia montana* Gray? Perennial herbs; stems erect, from a short subrhizomatous caudex, 6–12 dm tall, glabrous;

leaves petiolate, the blades laciniate-pinnatifid, mainly 4–20 cm long and about as broad; heads discoid, the disk 1.5–2.5 cm wide, 3–5 cm high; rays lacking; pappus an irregularly margined, almost toothed crown. Iron and Washington counties; Colorado; 2 (0).

*Rudbeckia occidentalis* Nutt. Western Coneflower. Perennial herbs; stems erect from a coarse ligneous rhizome, mainly 5–20 dm tall, glabrous or strigulose; leaves petiolate, the blades 5–20 cm long, 2.5–10 cm wide, ovate to ovate-lanceolate or lanceolate, attenuate to acuminate, entire, crenate-serrate, or dentate; heads discoid, the disks 1.5–2.5 cm wide, 3–6 cm long; rays lacking;



pappus a short crown. Mountain brush, aspen, grass-tall forb, and spruce-fir communities at 2135 to 3175 m in Cache, Carbon, Duchesne, Emery, Piute, Salt Lake, Sanpete, Sevier, Summit, Tooele, Utah, Wasatch, and Weber counties; Washington to Montana, south to California and Wyoming; 42 (iii).

SENECIO L.

Annual, biennial, or perennial herbs with rhizomes, caudices, or taproots, the juice watery; stems erect, ascending, or decumbent at the base; leaves alternate, simple, entire, toothed, or lobed to pinnatifid; heads solitary, or few to many in corymbose cymes; involucre bracts in 1 series, often with smaller bractlets at the base, green throughout or the

margins scarious or hyaline, or variously colored; receptacle flat or convex, naked; ray flowers yellow or orange, or sometimes lacking; pappus or capillary bristles; style branches flattened; achenes subterete, 5- to 10-nerved, glabrous or pubescent. **Note:** This genus consists of a series of species that intergrade freely when they are in contact with others of the group. Because of hybridization the species lines tend to be blurred, and it is not possible to place all specimens with confidence. Keys are, and have been, based on features that are subject to interpretation; the present one is not an exception, being tentative at best.

BARKLEY, T. M. 1978. *Senecio*. N. Amer. Flora II. 10:50-139.

1. Leaves pinnatilobate with linear-filiform divisions or entire and linear-filiform; stems with leaves only gradually reduced upward, often more or less woody below ..... 2
- Leaves variously lobed, toothed, or entire, but the segments and leaves not linear-filiform; stems with leaves various, seldom, if at all, woody at the base ..... 3
- 2(1). Heads cylindric, subcylindric, or narrowly campanulate; main involucre bracts 8-13, the outer ones much reduced and inconspicuous; plants glabrous .. *S. spartioides*
- Heads campanulate to broadly campanulate; main involucre bracts 13-21, the outer ones conspicuous, or, if inconspicuous, the plants tomentose ..... *S. douglasii*
- 3(2). Heads nodding, especially in bud, or, if erect, with both distinctly black triangular tips on involucre bracts and cauline leaves prominently clasping ..... 4
- Heads erect, even in bud; plants various but not as above ..... 7
- 4(3). Heads discoid ..... 5
- Heads radiate ..... 6
- 5(4). Heads 8-12 mm high, 6-9 mm wide, narrowly campanulate, conspicuously pedunculate ..... *S. pudicus*
- Heads 12-20 mm high, 14-20 mm wide, broadly campanulate, short-pedunculate ..... *S. bigelovii*
- 6(4). Heads erect, the involucre bracts black-tipped ..... *S. crassulus*
- Heads nodding, the involucre bracts often suffused with purple throughout, but not especially black tipped ..... *S. amplexens*
- 7(3). Plants annual or winter annual, introduced weedy species ..... *S. vulgaris*
- Plants perennial, indigenous species ..... 8
- 8(7). Stems uniformly leafy to the inflorescence, or the leaves concentrated upward ..... 9
- Stems few leaved, or the upper leaves definitely reduced in size and distribution ..... 12
- 9(8). Stems 1-3 dm tall, more or less sprawling, arising from a subrhizomatous caudex ..... *S. fremontii*
- Stems mostly 2-15 dm tall, erect or ascending, arising from a rhizome or a caudex ..... 10

10(9). Plants mainly 2–4 dm tall; leaves pinnatifid to lobed or laciniate; involucrel bracts with dark tips ..... *S. eremophilus*

– Plants mainly 5–10 dm tall; leaves dentate to serrate; involucrel bracts uniformly greenish or brownish ..... 11

11(10). Leaf blades acute to obtuse basally, the teeth all about alike ..... *S. serra*

– Leaf blades truncate to obtuse basally, or more or less hastately lobed, the lowermost teeth often the largest ..... *S. triangularis*

12(8). Plants glaucous tall herbs, semiaquatic; leaves entire or denticulate, thick and leathery ..... *S. hydrophilus*

– Plants not or seldom glaucous, terrestrial; leaves entire, toothed, or pinnatifid, not thick and leathery ..... 13

13(12). Rays orange or orange-red (see also *S. pauperculus*) ..... *S. crocatus*

– Rays yellow or lacking ..... 14

14(13). Heads discoid; plants tomentose, soboliferous ..... *S. fendleri*

– Heads radiate (or rarely discoid in some individuals); plants tomentose, glabrate, or glabrous, not soboliferous (except in *S. wernerifolius*) ..... 15

15(14). Leaves pinnatifid, at least the cauline ones, or the basal ones commonly rounded apically or oblanceolate to ovate or oval in outline ..... 16

– Leaves serrate to entire, the basal ones variously shaped, but mainly acute to attenuate apically ..... 20

16(15). Basal leaves distinctly pinnately divided, the lobes often again toothed ..... *S. multilobatus*

– Basal leaves merely toothed to subentire ..... 17

17(16). Basal and lower cauline leaves entire to dentate, but not pinnatifid ..... *S. hartianus*

– Basal and lower cauline leaves toothed to pinnatifid ..... 18

18(17). Middle and upper cauline leaves clasping with large auriculate bases ..... *S. dimorphophyllus*

– Middle and upper cauline leaves without a prominent clasping or auriculate base ..... 19

19(18). Basal leaves obovate to oblanceolate or ovate, rounded apically, thickish; plants of dryish habitats ..... *S. streptanthifolius*

– Basal leaves oblanceolate to elliptic, obtuse, but usually pointed apically, thin; plants of meadows ..... *S. pauperculus*

20(15). Cauline leaves rounded and more or less clasping basally, long-attenuate apically, entire or denticulate ..... *S. integerrimus*

– Cauline leaves tapering to the base or with a few basal clasping lobes in some, usually not attenuate apically ..... 21

21(20). Stems subscapose, the cauline leaves none or few and bractlike; plants often soboliferous or with a branching rhizomatous caudex ..... *S. wernerifolius*

– Stems more or less leafy, the cauline leaves gradually reduced upward, but hardly bractlike; plants seldom as above ..... 22

22(21). Involucrel bracts ca 8 or fewer; heads 5–6 mm wide, mainly 20–60 per inflorescence ..... *S. atratus*

– Involucrel bracts mostly 13–21; heads 8–12 mm wide or more, fewer or larger than above ..... 23

- 23(22). Achenes glabrous; plants often less than 20 cm tall ..... 24  
 — Achenes hirtellous or hispidulous; plants often over 20 cm tall ..... 25
- 24(23). Main leaves regularly and evenly pinnatifid or pinnatisect; plants often with slender rhizomes ..... *S. fendleri*  
 — Main leaves entire to dentate, not as above; plants shortly rhizomatous ..... *S. canus*
- 25(23). Main leaves 10–15 cm long or more, entire or denticulate; plants 50–70 cm tall, of northern Utah ..... *S. sphaerocephalus*  
 — Main leaves 2–8 cm long, dentate, serrate, or subentire; plants mainly 15–35 cm tall, of southern Utah ..... *S. neomexicanus*

***Senecio amplexens* Gray** Alpine Groundsel. Perennial short-rhizomatous herbs; stems ascending to erect, mainly 8–30 cm tall; herbage glabrous or sparingly tomentose; main leaves middle and lower cauline, the lower ones broadly petiolate, more or less clasping the stem, the blades 3–10 cm long, 0.8–3 cm wide, dentate to shallowly lobed; cauline leaves becoming short-petiolate or sessile upward, finally bractlike; heads 1–5 (rarely more), conspicuously nodding, corymbose; involucre broadly hemispheric, 10–15 mm long and about as wide or wider; bracts mainly ca 21, usually brown, with scarious margins, glabrous; outer bracts to about half as long as the inner; rays 7–17, yellow, 10–25 mm long; pappus white; achenes glabrous. Spruce-fir and alpine tundra communities, often in talus or on ridge margins, at 3050 to 3570 m in Beaver, Grand, Piute, San Juan, Sanpete, and Utah counties (Wasatch, Tushar, and La Sal mountains, and Wasatch Plateau); Montana, Wyoming, Colorado, and Nevada; 24 (v). Our material belongs to var. *holmii* (Greene) Harrington [*S. holmii* Greene; *Ligularia holmii* (Greene) W.A. Weber].

***Senecio atratus* Greene** Perennial subrhizomatous herbs from a branching caudex; stems erect or ascending, 2–8 dm tall; herbage floccose-tomentose; basal and lower cauline leaves petiolate, mainly 8–30 cm long, 1–4 cm wide, the blade oblanceolate or oblong, conspicuously dentate to subentire; cauline leaves gradually reduced upward, becoming sessile or subsessile and finally bracteate; heads ca 15–60, in more or less compact corymbose clusters; involucre 6–8 mm high, 3–6 mm wide; main bracts 8 or fewer, greenish to brownish, the margins scarious, the tips black, tufted-hairy apically; rays 3–5, yellow, 4–8 mm long; pappus white; achenes

glabrous. Aspen, spruce-fir, mixed conifer, and tall forb communities at 2440 to 3335 m in Duchesne, Garfield, Iron, San Juan, Salt Lake, Sanpete, and Uintah counties; Colorado and New Mexico; 22 (iv).

***Senecio bigelovii* Gray in Torr.** Bigelow Groundsel. Perennial subrhizomatous herbs; stems erect, mainly 3–8 (10) dm tall; herbage floccose-tomentose to glabrate or glabrous; main leaves cauline, largest below, reduced gradually upward, petiolate below, sessile and clasping to auriculate above, mostly 7–15 cm long, 0.6–3 (5) cm wide, the blades oblanceolate to oblong or elliptic, subentire to serrate; heads 3–8, nodding, racemosely arranged; involucre 8–12 mm long, 12–25 mm wide; bracts mainly ca 21, usually brown, with scarious margins, the outer to half as long as the inner, all sparingly tomentose; ray flowers lacking; achenes glabrous. Mountain brush, ponderosa pine, aspen, and spruce-fir communities at 2745 to 3175 m in San Juan County; Wyoming south to New Mexico and Arizona; 2 (0). Our material has been assigned to var. *hallii* Gray; the type variety is more southern.

***Senecio canus* Hook.** Gray Groundsel. [*S. purshianus* Nutt.; *S. convallium* Greenm., type from Rabbit Valley]. Perennial short-rhizomatous herbs, often with a caudex; stems 8–30 cm tall (rarely more), erect or ascending; herbage woolly-tomentose; basal leaves petiolate, the blades 1–5 cm long, 3–30 mm wide, lanceolate to oblanceolate, elliptic or ovate, entire or denticulate, obtuse to rounded apically; cauline leaves reduced upward, the upper ones often clasping, finally bracteate, occasionally lobed in some introgressant forms; heads mainly 2–10, subumbellate or corymbose; involucre 3–8 mm long, 4–10 mm wide; main bracts 13–21, lance-attenuate, greenish or with brownish



midstripe, glabrous or tomentose; outer bracts very short; rays 8–13, yellow, 5–10 mm long; achenes glabrous. Pinyon-juniper, sagebrush, Douglas fir, aspen, spruce-fir, and alpine tundra communities, often in talus or on windswept ridges, at 2105 to 3815 m in Beaver, Box Elder, Cache, Carbon, Daggett, Duchesne, Garfield, Iron, Juab, Millard, Piute, San Juan, Sanpete, Sevier, Summit, Uintah, and Utah counties; British Columbia to Manitoba, south to California, Nevada, Colorado, and Kansas; 56 (xiii). This attractive grayish white species forms intermediates with *S. multilobatus*, *S. streptanthifolius*, and *S. wernerifolius*.

*Senecio crassulus* Gray Perennial short-rhizomatous herbs, often with a caudex; stems 15–50 cm tall or more, erect; herbage glabrous; lower leaves broadly petiolate, the main ones 3–15 cm long, 0.6–3 (5) cm wide, lanceolate to elliptic or oblanceolate, dentate to entire; cauline leaves reduced upward, becoming sessile and clasping; heads solitary or 2–12, corymbose; involucre 8–13 mm high, 12–21 mm wide; main bracts 8–21, oblong to lance-oblong, greenish to brown, with scarios margins, the tips black and tufted-hairy; outer bracts to half as long as the inner or more; rays 8–13, yellow, 5–12 mm long; achenes glabrous. Aspen, lodgepole pine, and spruce-fir communities, often in forb-grass meadows, at 1830 to 3355 m in Box Elder, Cache, Carbon, Duchesne, San Juan, Salt Lake, Sanpete, Sevier, Summit, and Utah counties; Oregon to Montana, south to New Mexico; 34 (iv).

*Senecio crocatus* Rydb. Perennial sub-rhizomatous herbs, the caudex more or less developed; stems erect, mainly 2–8 dm tall;

herbage glabrous or with minute hairs in the inflorescence; basal leaves with long slender petioles, the blades 1–8 cm long, 1–4 cm wide, ovate to oblong, lanceolate, or elliptic, subcordate to acute basally, often rounded apically, entire to crenate-dentate; cauline leaves reduced upward, becoming lobed or sublyrate, sessile and sometimes auriculate and/or clasping; heads mainly 3–30; involucre 4–8 mm long, 5–8 mm wide; main bracts 13–21, lance-oblong, green or suffused with red or purple; outer bracts very short; rays 6–13, orange or orange-red; pappus white; achenes glabrous. Rush-grass, willow, aspen-forb, and lodgepole pine communities at 2195 to 2990 m in Cache, Duchesne, Rich, Summit, and Utah counties; Colorado; 23 (i). One specimen from Rich County (Thorne 1465 BRY) is apparently intermediate with *S. eremophilus*. The species is remarkably like the next.

*Senecio dimorphophyllus* Greene Perennial subrhizomatous herbs; stems erect, mainly 30–70 cm tall; herbage glabrous or essentially so; basal leaves with long slender petioles, the blades 1–7 cm long, 1–5 cm wide, oval to oblong or elliptic, subcordate to acute basally, commonly rounded apically; cauline leaves becoming sessile, lyrate-pinnatifid, and auriculate-clasping, the auricles often lobed; heads mainly 2–25, subumbellately to corymbosely arranged; involucre 5–8 mm high, 6–10 mm wide; main bracts 13–21, lance-attenuate, green, sometimes suffused reddish, the tips not black, tufted-hairy; outer bracts very short; rays 8–13, yellow, 5–8 mm long; pappus white; achenes glabrous. Two weakly discernible varieties are present in Utah.

- 1.      Cauline leaves merely lobed to subentire; plants of the La Sal Mountains ..... *S. dimorphophyllus* var. *intermedius*
- Cauline leaves sharply lobed; plants of Uinta Mountains and Wasatch Plateau ..... *S. dimorphophyllus* var. *dimorphophyllus*

**Var. *dimorphophyllus*** Aspen-tall forb and spruce-fir communities at 1860 to 3265 m in Duchesne, Emery, Sanpete, and Utah counties; Wyoming and Colorado; 9 (0). Utah materials approach *S. crocatus* in most morphological features, including the tall stature. If the flower color is discounted and the larger heads are not definitive, then the specimens

could be considered as a portion of *S. crocatus*. Some specimens from Duchesne County appear to be transitional to *S. sphaerocephalus*.  
**Var. *intermedius*** T.M. Barkley Wet meadows at 3050 to 3115 m in the La Sal Mountains, San Juan County (type from Geyser Pass); endemic; 2 (0).

*Senecio douglasii* DC. Suffrutescent perennials; stems erect or ascending, mainly 3–8 (10) dm tall; herbage glabrous or tomentose; leaves simple and linear-filiform or pinnatifid into linear-filiform segments, 2–11 cm long, 0.8–3 mm wide; heads few to numerous, in paniculately branched subcorymbose cymes; involucre campanulate, mainly 5–10 mm long, 6–14 mm wide; main bracts 13–21,

lance-oblong, green, with scarious margins, minutely tufted-hairy apically; the outer bracts short and inconspicuous or to half as long as the inner ones; rays 8–17, yellow, 10–18 mm long; pappus white; achenes hairy. Two infraspecific taxa, previously treated at specific rank with some justification, are present in Utah.

1. Herbage grayish or whitish tomentose; outer involucral bracts short and inconspicuous; plants rather broadly distributed ..... *S. douglasii* var. *longilobus*
- Herbage green, glabrous or essentially so; outer involucral bracts to about half as long as the inner ones; plants of Washington County ... *S. douglasii* var. *monoensis*

**Var. *longilobus* (Benth.) L. Benson** [*S. longilobus* Benth.; *S. filifolius* var. *jamesii* T. & G., nom. illeg.]. Warm desert shrub, salt desert shrub, sagebrush-rabbitbrush, saltgrass, and pinyon-juniper communities at 1095 to 2200 m in Beaver, Duchesne, Garfield, Iron, Kane, Millard, Piute, San Juan, Sevier, Washington, and Wayne counties; Arizona to Texas; 52 (x).

**Var. *monoensis* (Greene) Jepson** [*S. monoensis* Greene]. Creosote bush, blackbrush, other warm desert shrub, and pinyon-juniper communities at 760 to 1465 m in Washington County; California to Texas; 23 (vi).

***Senecio eremophilus* Richards.** Perennial subrhizomatous herbs; stems rather equably leafy, erect or ascending, mainly 2.5–9 dm tall; herbage glabrous or essentially so; lower leaves often deciduous or withered at anthesis; cauline leaves 2–15 cm long (or more), 0.4–5 (7) cm wide, oblanceolate to elliptic, or lanceolate in outline, pinnatifid or pinnately lobed or toothed, the lower ones petiolate, becoming sessile upward; heads several to numerous, corymbose; involucre 5–8 mm high, 6–10 mm wide; main bracts 8–17, lance-oblong, brownish or greenish, with scarious margins, blackish tips, and hair-tufted apices; outer bracts very short; rays 7–10, yellow, 5–10 mm long; pappus white; achenes glabrous or puberulent along the ribs. Grass-forb, ponderosa pine, aspen, lodgepole pine, spruce-fir, and alpine tundra communities, at 1615 to 3450 m in Beaver, Carbon, Duchesne, Emery, Garfield, Grand, Iron, Juab, Piute, San Juan, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah,

Wasatch, Washington, and Wayne counties; British Columbia and Mackenzie south to Arizona and New Mexico; 104 (xiv). Our material belongs to var. *kingii* (Rydb.) Greenm. [*S. kingii* Rydb., type from Cottonwood Canyon]. This plant forms intermediates with *S. spartioides*.

***Senecio fendleri* Gray** Perennial rhizomatous herbs, with a caudex more or less developed; stems mainly 5–30 cm tall, erect or ascending; herbage floccose-tomentose; basal leaves petiolate, the blades 1–6 cm long, 4–20 mm wide, pinnatifid or pinnately lobed; cauline leaves reduced upward, becoming sessile, finally bracteate; heads 3 to many, corymbose; involucre 4–6 mm high, 5–8 mm wide; main bracts ca 13, lance-attenuate, greenish, the margins scarious or hyaline, minutely hairy apically, more or less tomentose below; outer bracts very short; ray flowers lacking; pappus white; achenes glabrous. Ridge tops on limestone barrens near Musine Peak, at ca 2960 to 3295 m in Sanpete County (Lewis 4274, 5516 BRY); Wyoming south to New Mexico; 2 (0). Our specimens approach *S. canus*, more or less.

***Senecio fremontii* T. & G.** Perennial herbs, subrhizomatous or from a caudex and taproot; stems 0.6–4 dm tall; herbage glabrous; leaves cauline, 1–6 cm long, 0.5–2 cm wide, oblanceolate to obovate, shortly petiolate or sessile and somewhat clasping, dentate to subentire; heads 1–5; involucre 6–12 mm high, 7–12 mm wide; main bracts 8–17, lance-oblong or lance-attenuate, green or brown, the margins scarious, tufted hairy apically; outer bracts short and inconspicuous or

to half as long as the inner ones; rays 7–10, yellow, 5–12 mm long; pappus white;

achenes glabrous or hairy. Two rather weak varieties are present.

1. Involucres mostly 8–10 mm high; stems mostly less than 20 cm high ..... *S. fremontii* var. *fremontii*
- Involucres 10–12 mm high; stems often over 30 cm tall ..... *S. fremontii* var. *blitoides*

**Var. *blitoides* (Greene) Cronq.** [*S. blitoides* Greene]. Alpine communities, often in talus or on rock outcrops, at 2745 to 3355 m in Salt Lake (?), Tooele, and Utah counties; Wyoming to Colorado; 9 (0).

**Var. *fremontii*** Spruce-lodgepole pine and alpine tundra communities at 3050 to 3965 m in Duchesne, San Juan, Salt Lake, Summit, Uintah, and Utah counties; British Columbia and Alberta, south to Oregon and Wyoming; 16 (v).

***Senecio hartianus* Heller** Perennial herbs from a subrhizomatous or stoloniferous caudex; stems erect, 2–5 dm tall; herbage floccose-tomentose, sometimes glabrate; basal leaves petiolate, the blades 1–5 cm long, 0.5–3 cm wide, oval to obovate or elliptic, serrate or crenate, rounded apically; cauline leaves reduced upward, subpinnatisect to entire; heads 3–12, corymbose; involucre 4–7 mm high and as broad; main bracts 13–21, lance-attenuate, greenish, the tips glabrous; rays ca 10–13, yellow, 5–8 mm long; achenes glabrous. Ponderosa pine community at ca 2290 m in Kane County (Atwood 7425 BRY); Arizona; 1 (0).

***Senecio hydrophilus* Nutt.** Water Groundsel. Perennial subaquatic herbs from a caudex and fibrous roots; stems erect, mainly 4–10 dm tall; herbage glaucous, blue-green; basal and lower cauline leaves petiolate, the broad petioles with clasping bases, the blades 5–35 cm long or more, 1–10 cm wide, elliptic to oblanceolate, entire or denticulate, thick and leathery; cauline leaves reduced upward, becoming sessile, finally bracteate; heads numerous in a branching corymbose cluster; involucre 5–8 mm long, 4–76 mm wide; main bracts 8–13, oblong or lance-attenuate, yellowish, the tips often black, tufted-hairy; rays 3–5 or lacking, yellow, 3–8 mm long; pappus white; achenes glabrous. Stream banks, pond margins, and wet meadows at 1375 to 2745 m in Carbon, Garfield, Juab, Kane, Piute, Salt Lake, Sanpete, Sevier, Summit, and Utah

counties; British Columbia, south to California and Colorado; 25 (iv).

***Senecio integerrimus* Nutt.** Wet-the-bed. Perennial herbs with a short subrhizomatous caudex; stems mainly 1–6 (7) dm tall, erect; herbage arachnoid-villous or glabrate; basal and lower cauline leaves broadly petiolate, 3–20 cm long, 0.8–4 cm wide, lanceolate to elliptic or oblanceolate to oblong, entire or serrate to dentate, rounded to obtuse apically; cauline leaves reduced upward; heads few to many, in a corymbose to subumbellate cyme; involucre 6–12 mm high, 8–18 mm wide; main bracts 13–21, lance-attenuate, green, with scarious margins and black tips, the tips tufted-hairy; outer bracts very short; rays 8–13 (or lacking), yellow, 4–15 mm long; pappus white; achenes glabrous. Sagebrush, pinyon-juniper, forb-grass, mountain brush, ponderosa pine, aspen, and spruce-fir communities at 1460 to 3660 m in probably all Utah counties; British Columbia to Montana, south to California; 132 (xiv). Presumed hybrids with *S. dimorphophyllus* are known (Hansen sn 1976 BRY).

***Senecio multilobatus* T. & G.** Uinta Groundsel. [*S. lapidum* Greenm., type from Silver Reef]. Perennial (or biennial?) herbs from a taproot; stems mainly 1–6 dm tall; herbage glabrous, glabrate, or tomentose throughout or only in axils of basal leaves; basal leaves 2–12 cm long, 0.3–3.5 cm wide, spatulate to obovate in outline, pinnatifid to lyrate-pinnatifid, the segments variously again toothed, petiolate; cauline leaves reduced upward, finally bracteate; heads few to many, corymbose or subumbellate; involucre 4–9 cm high, 4–10 mm wide; main bracts 13–21, lance-attenuate or oblong-attenuate, the margins scarious, the apices hair tufted; rays 7–13, yellow, 4–10 mm long, or lacking; pappus white; achenes glabrous. Blackbrush, sandy desert shrub, pinyon-juniper, sagebrush, mountain brush, ponderosa pine, aspen, lodgepole pine, and spruce-fir



communities at 915 to 3420 m in all Utah counties (type from the Uinta River); Idaho and Wyoming to California, Arizona, and New Mexico; 312 (xliv). This widespread and common species forms presumed hybrids with *S. streptanthifolius* and *S. neomexicanus*.

*Senecio neomexicanus* Gray Perennial (or biennial?) herbs from a taproot; stems 14–40 cm tall, erect; herbage tomentose; basal and lower cauline leaves petiolate, the blades 1–5 cm long, 0.6–2 cm wide, oblanceolate to obovate or oval, dentate, serrate or subentire, toothed to obtuse apically; cauline leaves reduced upward, toothed to lobed or entire, bracteate in inflorescence; heads few to many, corymbose or subumbellate; involucre 4–7 mm high, 5–12 mm wide; main bracts 13–21, lance-attenuate, green or brown, with scarious margins, not especially hairy apically; rays 8–13, yellow, 4–10 mm long; pappus white; achenes pubescent. Sagebrush, mountain brush, ponderosa pine, and aspen communities at 2105 to 3050 m in Garfield, Kane, San Juan, and Wayne counties; Colorado, New Mexico, and Arizona; 10 (0). Our materials are assigned to var. *mutabilis* (Greene) Barkley [*S. mutabilis* Greene]. Through this variety there is virtually a complete intergrading series into *S. wernerii-folius*, *S. streptanthifolius*, and *S. multi-batus* (Barkley 1978).

*Senecio pauperculus* Michx. Perennial herbs from a subrhizomatous caudex; stems erect, mainly 2–4 dm tall; herbage glabrous or somewhat tomentose in axils of basal leaves; basal leaves petiolate, the blades mainly 2–6 cm long, 0.5–3 cm wide, oblanceolate to elliptic, obovate or ovate, crenate, dentate, or subentire; cuneate basally, toothed to obtuse apically; cauline leaves reduced upward, becoming sessile, pinnatifid, not especially auriculate, finally bracteate; heads few to many, corymbose or subumbellate; involucre 4–8 mm long, 5–9 mm

wide; main bracts 13–21, lance-attenuate, often with scarious margins, the tips not especially tufted-hairy; outer bracts very short; rays 8–13, yellow or yellow-orange, 4–10 mm long; pappus white; achenes glabrous or puberulent along the angles. Lodgepole pine and spruce-fir communities, usually in moist meadows, at 2345 to 2745 m in Daggett, Garfield, and Rich counties; Alaska to Labrador, south to Oregon and Georgia; 4 (0). Our material is intermediate to both *S. streptanthifolius* and *S. crocatus*.

*Senecio pudicus* Greene [*S. cernuus* Gray, not L.f.; *Ligularia pudica* (Greene) W.A. Weber]. Perennial herbs from a subrhizomatous caudex; stems 20–50 cm tall, erect; herbage glabrous; basal and lower cauline leaves petiolate, the blades 3–15 cm long, 0.5–3 cm wide, lanceolate to oblanceolate or narrowly elliptic, tapering basally, acute apically, entire or shallowly dentate; cauline leaves reduced upward, finally bracteate; heads few to many, nodding; involucre 5–9 mm long and as broad; main bracts 8–13, lance-oblong, green to brown, the margins scarious, tufted-hairy apically; outer bracts very short; ray flowers lacking; pappus white; achenes glabrous. Aspen, spruce-fir, and alpine tundra communities at 2650 to 3480 m in Carbon and Garfield counties; Colorado; 11 (i).

*Senecio serra* Hook. Perennial herbs from a caudex, with coarse, felt-covered roots; stems equably leafy, erect, 4–15 dm tall (or more), glabrous or sparingly tomentose; leaves 3–15 cm long, 0.4–4 cm wide, short-petiolate, the blades lanceolate to narrowly lanceolate or linear, dentate to subentire; heads several to numerous, corymbose; involucre 4–11 mm high, 2–10 mm wide; main bracts 8–13, lance-oblong, greenish to brownish, the margins scarious, black-tipped, hair tufted; outer bracts very short; rays 5–8, yellow, 3–10 mm long; pappus white; achenes glabrous or essentially so. Two rather distinctive varieties are present.

- 1. Involucral bracts 4–6 mm long, 2–6 mm wide; disk flowers ca 12; plants of central and northern Utah ..... *S. serra* var. *serra*
- Involucral bracts 6–8 mm long, 6–10 mm thick; disk flowers ca 20; plants of San Juan County ..... *S. serra* var. *admirabilis*

Var. *admirabilis* (Greene) A. Nels. [*S. admirabilis* Greene]. Ponderosa pine commu-

nity at ca 1830 m in San Juan County; Wyoming and Colorado; 1 (0).

**Var. *serra*** Sagebrush, mountain brush, aspen, forb-grass, lodgepole pine, and spruce-fir communities at 1830 to 3035 m in Box Elder, Cache, Davis, Duchesne, Juab, Rich, Salt Lake, Summit, Utah, and Weber counties; Washington to Montana, south to California and Nevada; 42 (vi).

***Senecio spartioides* T. & G.** Broom Groundsel. Perennial herbs from a taproot; stems equably leafy, erect or ascending, 2–10 dm tall or more, often in clumps; herbage

glabrous; leaves 2–10 cm long or more, linear, simple and entire or with linear lobes, mainly 1–3 mm wide (wider in some hybrid derivatives); heads several to many in branching corymbose cymes; involucre subcylindric to narrowly campanulate, 5–10 mm high, 4–8 mm wide; main bracts 8–13, lance-linear, green, the margins scarious, not tufted-hairy; outer bracts very short; rays 4–8, yellow, 7–12 mm long; pappus white; achenes white-hairy. Two intergrading varieties are present.

1. Leaves simple and unlobed, or, if lobed, lower cauline leaves often over 4 mm wide; plants widespread ..... *S. spartioides* var. *spartioides*
- Leaves commonly with 4–6 lateral lobes, seldom if ever more than 2.5 mm wide; plants of southeastern Utah ..... *S. spartioides* var. *multicapitatus*

**Var. *multicapitatus* (Greenm. in Rydb.)** Welsh comb. nov. [based on: *Senecio multicapitatus* Greenm. in Rydb. Bull Torrey Bot. Club 33: 160. 1906]. Warm desert shrub and pinyon-juniper communities, often in saline riparian sites, at 1220 to 1895 m in Garfield, Grand, San Juan, and Wayne counties; Colorado, Arizona, New Mexico, and Texas; 11 (vii). Barkley (1978) hesitated to combine *S. multicapitatus* with *S. spartioides*, because of field distinctions. They are, however, much alike and evidently lack diagnostic criteria that will allow segregation of all specimens. Further, specimens intermediate between *S. spartioides* and *S. eremophilus* bear “multicapitatus” leaves. I follow a moderate course in maintaining this taxon at varietal level.

**Var. *spartioides*** [*S. incurvus* A. Nels., type from Zion National Park]. Warm desert shrub, pinyon-juniper, sagebrush, mountain brush, and aspen communities, often in sand, at 1155 to 2870 m, in Beaver, Duchesne, Emery, Garfield, Grand, Iron, Kane, Piute, San Juan, Sanpete, Sevier, Uintah, Washington, and Wayne counties; Wyoming to South Dakota, south to California and New Mexico; 75 (xxv). Intermediates are formed with *S. eremophilus*.

***Senecio sphaerocephalus* Greene** [*S. lugens* var. *hookeri* D.C. Eaton, type from Summit (?) County]. Perennial herbs from a short stout rhizome; stems erect or ascending, 3–8 dm tall; herbage tomentose; basal leaves petiolate, the blades 4–15 cm long, 1–3.5 cm wide, oblanceolate to elliptic, entire or denticulate, obtuse apically; cauline leaves re-

duced upward, becoming sessile, finally bracteate; heads few to many, corymbose; involucre 3–7 mm long, 6–12 mm wide; main bracts 13–21, oblong- to ovate-lanceolate, greenish or brownish, with scarious margins, the tips black, hair-tufted apically; outer bracts very short; rays 8–13, yellow, 4–10 mm long; pappus white; achenes hairy. Lodgepole pine and spruce-fir communities, in meadows, at 2315 to 3205 m in Daggett, Duchesne, Summit, and Wasatch counties; Oregon and Montana, south to Nevada and Wyoming; 10 (i).

***Senecio streptanthifolius* Greene** [*S. aquariensis* Greenm., type from Aquarius Plateau; *S. jonesii* Rydb., type from Alta; *S. leonardii* Rydb., type from American Fork Canyon; *S. malmstenii* Blake in Tidestr., type from Wasatch Mountains; *S. rubricaulis* var. *aphanactis* Greenm., type from Logan; *S. wardii* Greene, type from Fish Lake Mountain]. Perennial herbs from a taproot and simple or branched and infrequently subrhizomatous caudex; stems erect, mainly 8–47 cm tall; herbage glabrous or rarely sparingly tomentose; leaves thickish; basal leaves petiolate, the blades 1–5 cm long, 0.3–3 cm wide, oblanceolate to obovate, suborbicular, elliptic, or ovate, crenate, dentate, or subentire, less commonly lobed; cauline leaves reduced upward, commonly some of them pinnatifid, finally bracteate; heads few to many, corymbose to subumbellate; involucre 4–8 mm high, 5–12 mm wide; main bracts 8–21, lance-oblong, green or brownish, the margins scarious, sparingly hair-tufted apically; outer

bracts very short; rays 8–13, yellow, 5–8 mm long; pappus white; achenes glabrous. Sagebrush, mountain brush, ponderosa pine, aspen, lodgepole pine, spruce-fir, and alpine tundra communities, often in meadows, at 1370 to 3415 m in Box Elder, Cache, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Juab, Kane, Millard, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, Washington, Wayne, and Weber counties; Yukon to Northwest Territories, south to California and New Mexico; 107 (vii). This species forms a plexus around which revolves such species as *S. pauperculus*, *S. multilobatus*, *S. neomexicanus*, and *S. canus*, as judged from morphological intermediates, which are presumed to be hybrids.

***Senecio triangularis* Hook.** Arrowleaf Groundsel. Perennial herbs from a caudex and more or less well-developed rhizome; stems equably leafy, erect, 2.5–12 dm tall or more; herbage glabrous or sparingly tomentose; leaves petiolate, the blades mainly 3–15 cm long, 0.5–6 cm wide, lance-oblong to triangular, abruptly contracted or subhastate at the base, dentate to sinuate dentate or subentire, finally bracteate in the inflorescence; heads few to many, subcorymbose; involucre 6–12 mm high, 8–17 mm wide; main bracts 8–12, lance-attenuate, the margins often scarious, tufted-hairy apically; outer bracts very short; rays 5–9, yellow, 6–15 mm long; pappus white; achenes glabrous. Aspen-mountain brush, Douglas fir-white fir, lodgepole pine, and spruce-fir communities at 1765 to 3265 m in Cache, Duchesne, Grand, Salt Lake, Summit, Utah, and Weber counties; Alaska and Yukon, south to California and New Mexico; 25 (viii).

***Senecio vulgaris* L.** Common Groundsel. Plants annual or biennial, with fibrous roots, 1–5.5 dm tall, the stems glabrous or sparingly villous; basal leaves smaller than the main cauline ones, often withered by anthesis; cauline leaves not much reduced upward, 2–10 cm long, 0.5–4.5 cm wide, irregularly pinnatifid, the lobes again toothed, glabrous

or more or less villous, especially along the veins beneath, the lower ones petiolate, the upper ones becoming sessile and auriculate-clasping; heads few to many; involucre 5–8 mm high, 4–10 mm wide; the outer bracts short and black tipped, the inner lance-linear, green, with scarious margins, black tipped; ray flowers lacking; pappus white; achenes hairy. Weedy species of disturbed sites in Salt Lake and Utah counties; adventive from Europe; 6 (0).

***Senecio werneriiifolius* (Gray) Gray** [*S. aureus* var. *werneriiifolius* Gray]. Plants commonly rhizomatous or soboliferous herbs; stems erect or ascending, 3–18 cm tall; herbage tomentose, often glabrate or glabrous in age; basal leaves petiolate, the blades 0.6–3 cm long, 0.4–2 cm wide, oval to elliptic, obovate, or oblanceolate, thickish, sometimes revolute; cauline leaves few, commonly inconspicuous and bracteate; heads 1–4; involucre 4–10 mm long, 7–15 mm wide; main bracts 13–21, lance-oblong, green or suffused with purple, the margins scarious, hair tufted apically; outer bracts to half as long as the inner; rays 8–13, yellow, 4–10 mm long; pappus white; achenes glabrous. Ponderosa pine, western bristlecone pine, aspen-conifer, and spruce-fir communities, often in semibarrens, at 2375 to 3600 m in Beaver, Duchesne, Garfield, Iron, Juab, Piute, Salt Lake, Summit, and Utah counties; Idaho and Montana, south to California, Nevada, and Arizona; 28 (ii).

SOLIDAGO L.

Perennial herbs from a caudex or rhizome; leaves alternate, simple; heads numerous, radiate, yellow, borne in paniculate, racemose, or cymose clusters; involucre imbricate in several series or subequal, commonly chartaceous or with the tips green; receptacle flat, naked; ray flowers fertile; disk flowers perfect, fertile; anthers subentire basally; style branches with lanceolate appendages; pappus of capillary bristles; achenes few nerved, pubescent.

1. Heads in corymbs or flat-topped cymes; leaves punctate; plants of lower elevations riparian habitats [*Euthamia*] ..... *S. occidentalis*
- Heads racemose or panicled; leaves not punctate; plants of various habitats ..... 2
- 2(1). Stems glabrous ..... 3
- Stems puberulent with short incurved hairs or villous with multicellular hairs ..... 4



- 3(2). Plants definitely rhizomatous; involucre 2.5–4 mm long; plants of lower elevations ..... *S. missouriensis*
- Plants subrhizomatous; involucre 4–6 mm long; plants of higher elevations ..... *S. spathulata*
- 4(2). Stems villous with multicellular hairs; petioles long-ciliate ..... *S. multiradiata*
- Stems puberulent with short incurved hairs; petioles scabrous or strigose marginally ..... 5
- 5(4). Involucre 6–11 mm high, the outer bracts subfoliaceous ..... *S. parryi*
- Involucre 2–5 mm high, the bracts not subfoliaceous ..... 6
- 6(5). Leaves very numerous and much longer than the internodes, gradually attenuate or acuminate, not dimorphic, strongly 3-nerved ..... *S. canadensis*
- Leaves not very numerous, often less than twice as long as the internodes, acute or rounded apically, often dimorphic, with lateral nerves obscure or moderately apparent ..... 7
- 7(6). Leaves sparingly hairy to glabrous, the margins rough-hairy; plants widespread and common ..... *S. sparsiflora*
- Leaves cinereous-puberulent with disoriented hairs, the margins hairy like the surfaces; plants more restricted and less common ..... *S. nana*

*Solidago canadensis* L. Goldenrod. [*S. altissima* L.; *S. lepida* DC.]. Perennial herbs from creeping rhizomes; stems 3–12 dm tall or more; herbage puberulent with short incurved hairs, or the stems glabrous below; basal leaves often deciduous or withered at anthesis; cauline leaves numerous and crowded, 2–10 cm long or more, 3–20 mm wide, lanceolate to lance-linear, or narrowly elliptic, tapering to a sessile base, 3-nerved, serrate to entire, attenuate to acuminate apically; inflorescence commonly (but not always) of recurved branches with secund heads; involucre 2–5 mm high and about as broad, the bracts lance-attenuate, scarious or greenish; rays 10–17, yellow, 1–3 mm long. Riparian and other mesic sites at 350 to 2290 m in all Utah counties; widespread in North America; 87 (xvi). This plant serves as host for a peculiar red and black leaf beetle. A phase of the species is cultivated as an ornamental in Utah. Designation of varietal level in Utah seems academic. The species is transitional to *S. sparsiflora*.

*Solidago missouriensis* Nutt. Missouri Goldenrod. Perennial herbs from creeping rhizomes; stems 2–5 (9) dm tall; herbage glabrous or sparingly puberulent in inflorescence only; basal leaves oblanceolate, often withered at anthesis; main cauline leaves 2–13 cm long, 0.4–1.5 cm wide, oblanceolate to elliptic or linear, tapering to a ses-

sile base, mainly 3-nerved, entire or essentially so, acute to obtuse apically; inflorescence compact, with ascending branches, somewhat or not at all secund; involucre mostly 3–5 mm high and as broad, the bracts lance-attenuate, greenish to scarious; rays 7–13, yellow, 2–3 mm long. Riparian communities at 1525 to 2475 m in Box Elder, Carbon, Daggett, Duchesne, Emery, Salt Lake, Sanpete, Summit, Uintah, and Wasatch counties; British Columbia to Ontario, south to Arizona, Texas, and Tennessee; 13 (ii).

*Solidago multiradiata* Ait. Low Goldenrod. [*S. ciliosa* Greene]. Perennial herbs from a rhizome or rhizomatous caudex; stems 5–45 cm tall; herbage villous with multicellular hairs, at least on upper stem and petiole bases; basal and lower cauline leaves 1.5–14 cm long, 5–24 mm wide, oblanceolate to spatulate or elliptic, tapering to a conspicuously ciliate petiole, obscurely 3-nerved, entire or serrate, rounded to obtuse apically; inflorescence loosely to densely corymbose; involucre 4–6 mm high, 5–7 mm wide, the bracts lance-oblong, green apically, with prominent midvein; rays ca 13, yellow, 4–5 mm long. Aspen, lodgepole pine, spruce-fir, and alpine tundra communities at 2745 to 3660 m in Beaver, Cache, Carbon, Duchesne, Garfield, Grand, Iron, Juab, Kane, Piute, San Juan, Salt Lake, Sanpete, Sevier, Summit,

Uintah, and Utah counties; Alaska to Quebec, south to California and New Mexico; 84 (xvii). Our specimens belong to var. *scopulorum* Gray.

*Solidago nana* Nutt. Dwarf Goldenrod. [*S. radulina* Rydb., type from Cottonwood Canyon]. Perennial herbs from a rhizome or subrhizomatous caudex; stems 13–48 cm tall; herbage densely canescent with fine hairs of mixed orientation; basal and lower cauline leaves petiolate, 1.5–9 cm long, 0.7–2.3 cm wide, oblanceolate to spatulate, tapering to a petiole, weakly 3-nerved, entire or slightly toothed, rounded to obtuse apically; cauline leaves definitely reduced upward; inflorescence corymbose, seldom if at all secund; involucre 4–6 mm high and about as broad; rays 5–8, yellow, 3–4 mm long. Desert shrub upward to spruce-fir communities, mainly in riparian or wet meadow sites, at 1460 to 2745 m in Duchesne, Kane, Salt Lake, Sevier, Summit, Uintah, Utah, and Wasatch counties; Idaho to Montana, south to Arizona and Colorado; 13 (i).

*Solidago occidentalis* (Nutt.) T. & G. Western Goldenrod. [*Euthamia occidentalis* Nutt.]. Perennial herbs from elongate rhizomes; stems erect, branched above, mainly 4–12 (20) dm tall; herbage essentially glabrous; leaves numerous, sessile, linear to lance-linear, 2–10 cm long, 1–10 mm wide; inflorescence usually large, leafy-bracted, broadly rounded; involucre 3.5–4.5 mm high and about as broad, the bracts narrowly oblong, greenish apically, the midnerve conspicuous; rays 15–30, yellow, 1.5–2.5 mm long. Riparian habitats at 850 to 1650 m in Box Elder, Cache (?), Carbon, Duchesne, Emery, Garfield, Grand, Juab, Kane, San Juan, Salt Lake, Uintah, Utah, Washington, and Weber counties; British Columbia and Alberta, south to California, New Mexico, and Nebraska; 42 (x). I follow tradition by including this taxon in *Solidago*; it might best be treated in *Euthamia*.

*Solidago parryi* (Gray) Greene Parry Goldenrod. [*Haplopappus parryi* Gray; *H. parryi* var. *minor* Gray, type from Alta]. Perennial rhizomatous herbs; stems erect or ascending, 8–50 cm tall; herbage scabrous to hispidulose; basal and cauline leaves petiolate, mainly 3–20 cm long, 0.9–3.8 cm wide, oblanceolate to elliptic, entire, obtuse to

rounded apically; cauline leaves becoming sessile and smaller upward, more or less clasping; heads few to many in compact branched cymes; involucre 8–11 mm high, 7–14 mm wide; outer bracts ovate to ovate-lanceolate, green, ciliate, the bases often scarious; inner bracts narrower and with scarious or hyaline margins; rays 12–20, yellow, 5–8 mm long. Aspen, tall forb, lodgepole pine, spruce-fir, and alpine tundra communities at 2285 to 3570 m in Beaver, Carbon, Duchesne, Emery, Garfield, Juab, Kane, Millard, Piute, San Juan, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, and Wasatch counties; Wyoming, New Mexico, Arizona; 50 (ix).

*Solidago sparsiflora* Gray [*S. garrettii* Rydb., type from Big Cottonwood Canyon]. Perennial rhizomatous herbs; stems erect or ascending, mainly 15–50 dm tall; herbage puberulent (often sparingly so on leaf surfaces); leaves cauline or basal, oblanceolate to elliptic or spatulate, mainly 1–10 cm long, 2–25 mm wide, entire or less commonly some of them serrate, acute to attenuate or obtuse to rounded apically, often dimorphic, with the upper ones reduced in size; inflorescence a pyramidal to conic or cylindric cluster, compact or with branches curved and heads secund; involucre 4–6 mm high and about as broad; bracts oblong to subulate, chartaceous basally, green apically, the midvein conspicuous; rays 5–10 or more, yellow, 3–4 mm long. Pinyon-juniper, mountain brush, sagebrush, aspen, ponderosa pine, and spruce-fir communities at 1125 to 3050 m in all Utah counties (except Box Elder and Morgan); Wyoming and South Dakota, south to Arizona and Nevada; 141 (xix). Our materials are far from uniform; in the hanging gardens of southeastern Utah they are transitional to *S. canadensis* (having more ray flowers), and at high elevations they are more or less intermediate with *S. spathulata*. Possible additional influence of *S. mollis* Bartl. and/or *S. nemoralis* Ait. is indicated, although neither of them is known from the state currently.

*Solidago spathulata* DC. Perennial herbs from a subrhizomatous caudex; stems 5–30 cm tall (rarely more), erect or ascending; herbage glabrous or somewhat scabrous and often glutinous above; basal leaves oblanceolate to spatulate, 2–15 cm long, 8–30 mm

wide, serrate to entire, obtuse to rounded apically; cauline leaves reduced upward, finally sessile and more or less clasping; inflorescence compact to elongate, narrow, the heads not secund; involucre 4–6 mm high and as broad or more; bracts oblong, scarious or greenish along the prominent midvein; rays 5–10, yellow, 2.5–4 mm long. Aspen, spruce-fir, and alpine tundra communities at 2440 to 3510 m in Beaver (?), Daggett, Duchesne, Emery, Garfield, Grand, San Juan, Sevier, Summit, and Uintah counties; Alaska to Quebec, south to California, Arizona, and New Mexico; 21 (v). Two completely intergrading phases, regarded as varieties, are present in Utah; a tall montane phase known as var. *neomexicana* (Gray) Cronq. [*S. multi-radiata* var. *neomexicana* Gray], and a dwarf

alpine phase known as var. *nana* (Gray) Cronq. [*S. humilis* var. *nana* Gray; *S. decumbens* Greene].

SONCHUS L.

Annual or perennial herbs from taproots or deep-seated, rhizome-like roots, the juice milky; leaves chiefly cauline, alternate, simple, entire to lobed or pinnatifid; heads few to several; involucre bracts imbricate in several series, green or greenish (drying brownish), the inner ones with hyaline margins; receptacle naked; corollas of ray-flowers only, yellow, perfect; pappus of capillary bristles; style branches semicylindrical; achenes compressed, several to many nerved, beakless, glabrous.

- 1. Plants perennial, spreading from rhizomelike roots; involucre more than 14 mm long in fruit ..... 2
- Plants annual from taproots; involucre less than 14 mm long in fruit ..... 3
- 2(1). Involucre and peduncles bearing coarse stipitate glands ..... *S. arvensis*
- Involucre and peduncles glabrous or tomentose, not stipitate-glandular ..... *S. uliginosus*
- 3(1). Leaves sharply and narrowly toothed, and sometimes lobed; achenes not transversely wrinkled, merely longitudinally nerved ..... *S. asper*
- Leaves sharply and broadly toothed, or merely toothed and lyrate pinnatifid; achenes transversely wrinkled and longitudinally nerved ..... *S. oleraceus*

*Sonchus arvensis* L. Field Sow-thistle. Plants perennial with deep-seated rhizome-like roots; stems 4–10 dm tall or more, pubescent with coarse stipitate glands, at least above, and often glabrous below; leaves 5–40 cm long, 0.8–10 cm broad, more or less pinnatifid, auriculate-clasping basally, acute to obtuse apically, prickly margined; heads few to several, the peduncles stipitate-glandular; involucre 14–20 mm high and 10–30 mm broad in fruit, the bracts lance-oblong to lance-linear, glandular like the peduncles; rays yellow, mostly 10–20 mm long; achenes transversely wrinkled. Weedy species of disturbed soils at 1370 to 2135 m in Cache, Duchesne, Salt Lake, and Utah counties; widely distributed and considered as a “noxious” weed in North America; adventive from Europe; 10 (0).

*Sonchus asper* (L.) Hill Spiny Sow-thistle. Plants annual from taproots; stems 3–10 dm tall, pubescent with coarse stipitate glands, at

least above, often glabrous below (less commonly throughout); leaves 3–15 cm long, 1–5 cm broad, merely lobed or lobeless, auriculate-clasping basally, acute to acuminate or less commonly obtuse apically, the margins armed with slender sharp prickles; heads few to several, the peduncles stipitate-glandular or glabrous; involucre 9–14 mm long and 10–16 mm wide in fruit, the bracts lance-oblong to lance-linear, glabrous or with few stipitate glands; rays yellow, mostly 5–10 mm long; achenes 2–3 mm long, several nerved, not transversely wrinkled. Weed of disturbed sites at 760 to 2135 m in Box Elder, Duchesne, Garfield, Grand, Kane, Millard, Piute, San Juan, Salt Lake, Sevier, Tooele, Uintah, Utah, and Washington counties; widespread in North America; adventive from Europe; 27 (ii).

*Sonchus oleraceus* L. Common Sow-thistle. Plants annual from taproots, the stems 2–10 dm tall or more, glabrous throughout or



sometimes with stipitate glands above; leaves 4–20 cm long, 0.6–10 cm broad, more or less lyrate-pinnatifid, auriculate-clasping basally, acute to obtuse apically, irregularly and broadly toothed, the teeth weakly prickly; heads few to several, the peduncles glabrous or stipitate-glandular; involucre 10–13 mm high and 8–20 mm broad in fruit, the bracts lance-linear to lance-oblong, glabrous or with a few stipitate glands; rays yellow, mostly 8–12 mm long; achenes 2–3 mm long, several nerved and transversely wrinkled. Weeds of disturbed sites at 850 to 2135 m in Duchesne, Garfield, Salt Lake, Utah, and Washington counties; widely distributed in North America; adventive from Europe; 9 (i).

***Sonchus uliginosus* Bieb.** Meadow Sow-thistle. Plants perennial from deeply seated rhizomelike roots; stems 4–10 dm tall or more; herbage glabrous or obscurely tomentose; leaves 5–40 cm long, 0.8–10 cm wide, pinnatifid, auriculate-clasping basally, acute to obtuse apically, prickly margined; heads few to several, the peduncles glabrous; involucre mainly 14–16 mm high and 10–20 mm broad in fruit; bracts lance-linear to oblong, glabrous or tomentose; rays yellow, mostly 10–20 mm long; achenes 2–3.5 mm long, several nerved, transversely wrinkled. Weeds of disturbed sites at 1220 to 2260 m in Daggett, Duchesne, Garfield, Grand, Juab,

Salt Lake, Uintah, and Utah counties; widespread in North America; adventive from Europe; 22 (ii). Authors of *Flora Europaea* (Tutin et al. 1976) treat this entity as *S. arvensis* ssp. *uliginosus* (Bieb.) Nyman. Arnow et al. (*Flora of the Central Wasatch Front, Utah*) discount the usefulness of stipitate glands as diagnostic features, noting that glandular and eglandular plants occur together in the same populations, and that glands are not correlated with other features. On a statewide basis the plants act like legitimate taxa, and the eglandular plants do seem to have somewhat smaller heads.

SPHAEROMERIA Nutt.

Perennial herbs or subshrubs; leaves alternate or mainly basal, simple and entire or pinnatifid to palmatifid; heads discoid, few to several, corymbose to subcapitate; involucre hemispheric to campanulate; bracts in 2 or 3 series, imbricate to subequal; receptacle conic or concave, naked; outer flowers pistillate, fertile; disk flowers perfect, fertile; pappus lacking or a short crown; achenes usually 5- to 10-ribbed, glabrous or glandular.

HOLMGREN, A. H., L. M. SHULTZ, AND T. K. LOWREY. 1976. *Sphaeromeria*, a genus closer to *Artemisia* than to *Tanacetum* (Asteraceae: Anthemidae). *Brittonia* 28: 255–262.

1. Plants pulvinate-caespitose; heads capitately arranged on subscapose branches; known from Garfield County ..... *S. capitata*
- Plants caulescent subshrubs; heads in paniculate or corymbose clusters on leafy branches, not of Garfield County ..... 2
- 2(1). Leaves pinnatifid, at least some, tomentose; heads paniculate; plants of Washington County ..... *S. ruthiae*
- Leaves entire or pinnatifid, glabrous; heads corymbose; plants not of Washington County ..... *S. diversifolia*

***Sphaeromeria capitata* Nutt.** [*Tanacetum capitatum* (Nutt.) T. & G.]. Pulvinate-caespitose herbs; herbage canescent with malpighian hairs; stems subscapose, 2–12 (20) cm tall; leaves mainly basal, 4–10 mm long, 1- or 2-palmately lobed, the cauline entire and reduced upward; heads few to numerous in a compact headlike cluster; involucre 3–5 mm high, the broad bracts with hyaline margins; corollas 2.5–3 mm long. With western bristlecone pine on Cedar Breaks limestone,

at ca 2380 m in Garfield County; Montana and Wyoming; 1 (0).

***Sphaeromeria diversifolia* (D.C. Eaton) Rydb.** [*Tanacetum diversifolium* D.C. Eaton]. Subshrubs, mainly 1–4 dm tall; herbage glabrous; leaves simple, entire, or some of them pinnately lobed, 8–55 mm long, 0.5–5 mm wide, linear; heads several to many in compact to open corymbose clusters; involucre 3–4 mm high, the broad bracts with hyaline margins; corollas 2–2.5 mm long.

Juniper, mountain brush, mixed conifer, and aspen communities upward to alpine tundra, often in rock crevices, at 1370 to 3205 m in Davis, Juab, Millard, Salt Lake, Tooele, and Utah counties; Nevada; 33 (i). This is a Great Basin endemic.

*Sphaeromeria ruthiae* Holmgren, Shultz, and Lowrey Subshrubs, mainly 3–7 dm tall; herbage tomentose-canescens with malpighian hairs; leaves pinnately lobed or the upper ones entire, 1–9 cm long, 2–4 mm wide or more; heads several to many, paniculate; involucre 3–5 mm high, the broad bracts

with hyaline margins; corollas 1.8–2 mm long, yellow. Crevices in Navajo Sandstone, ponderosa pine community, in Washington County; endemic; 3 (0).

#### STEPHANOMERIA Nutt. Nom. Cons.

Annual, biennial, or perennial herbs with milky juice; leaves alternate, often pinnatifid; flowers all raylike, perfect, pink or white; involucre cylindric; main bracts few, subequal; outer bracts much shorter; receptacle naked; pappus of plumose bristles (barbellate in *S. spinosa*); achenes 5-angled or -ribbed.

1. Plants annual, from slender taproots ..... *S. exigua*
- Plants perennial, a caudex often more or less developed ..... 2
- 2(1). Plants spinescent; pappus barbellate ..... *S. spinosa*
- Plants unarmed; pappus plumose ..... 3
- 3(2). Involucres 12–15 mm high; heads with 10 or more flowers ..... *S. parryi*
- Involucres 5–12 mm high (rarely higher); heads with 3–9 flowers ..... 4
- 4(3). Main leaves runcinate-pinnatifid; plants commonly 1–2 dm tall ..... *S. runcinata*
- Main leaves entire or pinnatifid, often deciduous at anthesis; plants commonly 2–8 dm tall ..... 5
- 5(4). Stems very slender; leaves filiform to linear, entire or dentate; pappus bristles white (rarely brownish), plumose to the base ..... *S. tenuifolia*
- Stems not very slender; leaves linear-subulate, often pinnatifid or lobed; pappus brownish, scabrous toward the base ..... *S. pauciflora*

*Stephanomeria exigua* Nutt. Annual or biennial (winter annual) herbs from slender taproots; herbage glabrous or puberulent; stems 5–60 cm tall, erect and commonly branched from the base upward, often fistulose; main leaves 1–6 cm long, pinnatifid to bipinnatifid, deciduous or withered by anthesis; cauline leaves soon reduced and bracteate upward; heads more or less corymbose, terminating bracteate branchlets; involucre 5–10 mm high, 3–4.5 mm wide; main bracts usually 3–5; rays pink or white, 3–5 mm long; pappus of white to off-white bristles plumose in the upper half; achenes 3–4 mm long, tuberculate. Warm, mixed cool, and salt desert shrub, and pinyon juniper communities, often in sand, at 850 to 2230 m in Beaver, Emery, Garfield, Grand, Kane, Millard, San Juan, Sevier, Tooele, Uintah, Utah, Washington, and Wayne counties; Oregon to Wyoming, south to California and New Mexico; 84 (x).

*Stephanomeria parryi* Gray Perennial herbs; stems 1 to few, weak, branching, 8–25 cm tall; herbage glabrous; leaves 2–8 cm tall, runcinate-pinnatifid, thickish, the lobes weakly spinulose-tipped; heads terminating very short bracteate branches, 10- to 14-flowered; involucre 12–15 mm high; rays whitish, 15–20 mm long; pappus bristles tawny, scabrous at the base only; achenes 3–4 mm long, not rugose. Blackbrush community at ca 1460 m in Kane County (Atwood & Allen 2822a BRY); California to Arizona; 1 (0).

*Stephanomeria pauciflora* (Torr.) A. Nels. in Coult. & Nels. [*Prenanthes?* *pauciflora* Torr.]. Perennial herbs (or somewhat woody below) from a caudex, branched from the base, mostly 30–60 cm tall; herbage glabrous; main leaves 2–7 cm long, runcinate-pinnatifid, the lobes weakly spinulose-toothed; heads terminating short to elongate branchlets, 3- to 5-flowered; involucre 8–10 mm high, 3–5 mm wide; main bracts 5; rays pink or white,

mainly 4-7 mm long; pappus bristles brownish, plumose except at the base; achenes 3.5-7 mm long, striate, more or less wrinkled. Warm, salt, and mixed desert shrub, and juniper communities, often in sandy soil, at 760 to 1525 m in Beaver, Garfield, Grand, Juab, Kane, Millard, San Juan (?), Tooele, and Washington counties; California to Kansas, south to Texas and Mexico; 26 (v).

*Stephanomeria runcinata* Nutt. Perennial herbs from a caudex; stems branched from the base, mostly 8-25 (30) cm tall; herbage glabrous, scabrous, or sparingly villous; main leaves 2-7 cm long, runcinate-pinnatifid, the lobes merely cuspidate; heads terminating naked or sparingly bracteate branchlets, commonly 5-flowered; involucre 9-12 mm high, 3.5-7 mm wide; rays pink, mainly 8-12 mm long; pappus bristles white, plumose almost to the base; achenes 4-5 mm long, tuberculate. Salt Desert shrub and pinyon-juniper communities at 1250 to 2535 m in Daggett, Duchesne, Emery, Grand, Uintah, and Wayne counties; Montana to Nebraska and Colorado; 17 (i).

*Stephanomeria spinosa* (Nutt.) Tomb [*Lygodesmia spinosa* Nutt.]. Perennial herbs from a woody caudex, the caudex branches clothed with brownish marcescent leaf bases, the axils copiously villous-hairy; stems 11-52 cm tall, thorny; herbage glabrous upward or the branches puberulent; leaves linear 0.5-7 cm long, 1-3 mm wide, reduced to bracteate scales upward, often lacking at anthesis;

heads terminal on short lateral branches or sessile, 3- to 5-flowered; involucre 5.7-10 mm high, 3-5 mm wide; main bracts oblong to lance-oblong, green or often suffused with purple; outer bracts proportionately broader; rays pink, 3-5 mm long; pappus bristles off-white, scabrous throughout; achenes 4-6.5 mm long, smooth. Desert shrub, sagebrush-grass, pinyon-juniper, mixed conifer, and aspen communities, often in moist sites, at 1675 to 3050 m in Beaver, Emery, Garfield, Juab, Kane, Millard, Piute, Sevier, Tooele, Washington, and Wayne counties; British Columbia to Montana, south to California and Arizona; 41 (ii).

*Stephanomeria tenuifolia* (Torr.) Hall Slender Wirelettuce. [*Prenanthes? tenuifolia* Torr.]. Perennial herbs from a woody caudex; caudex branches lacking or with few marcescent leaf bases, not hairy; stems 25-100 cm tall or more; herbage glabrous or puberulent; leaves filiform to linear, 1-8 (11) cm long, 1-3 (8) mm wide, entire or dentate, much reduced upward; heads terminating elongate or short lateral bracteate branchlets, 5-flowered; involucre 8-11.2 (16) mm high, 3-5 mm wide; main bracts lance-oblong, green, puberulent or glabrous; outer bracts very short; rays 4-8 (10) mm long, pink; pappus bristles white, dull white, or less commonly brownish, plumose to the base; achenes 4-6 mm long, longitudinally ribbed, smooth. Two more or less distinctive phases are present, recognizable as varieties.

1. Involucre 10-16 mm high, the bracts attenuate; basal leaves bipinnatifid, at least some; plants of Uintah County ..... *S. tenuifolia* var. *uintahensis*
- Involucres mainly 8-11.2 mm high, the bracts not especially attenuate; basal leaves seldom if ever bipinnatifid; plants of rather broad distribution ..... *S. tenuifolia* var. *tenuifolia*

**Var. *tenuifolia*** Desert shrub, hanging garden, pinyon-juniper, mountain brush, ponderosa pine, and white-fir communities, at 1155 to 2746 m in Beaver, Duchesne, Emery, Garfield, Grand, Iron, Kane, Piute, San Juan, Sevier, Uintah, Washington, and Wayne counties; British Columbia to Montana, south to California, Arizona, and Texas; 46 (xvi). The great sprawling plants of the canyonlands portion of Utah might be worthy of taxonomic consideration; sometimes they approach *S. pauciflora* in having tawny pappus bristles.

**Var. *uintahensis*** Goodrich & Welsh Ponderosa pine community at ca 2490 m in Uintah County; endemic; 2 (0).

#### STYLOCLINE Nutt.

Woolly annual herbs; stems commonly branched; leaves alternate, simple, entire; heads discoid, leafy bracted; involucre per se lacking; outer receptacular bracts subtending and enclosing pistillate flowers; receptacle cylindric; pistillate flowers many, deciduous with the enclosing bract, the bract apex hyaline; corollas filiform; pappus none; perfect



flowers (functionally staminate) few, surrounded by linear hyaline bracts; corollas tubular, the ovaries vestigial; pappus of 3–5 deciduous bristles; anthers sagittate basally; achenes ellipsoid, few nerved.

*Stylocline micropoides* Gray Desert Nest-straw. Annual woolly herbs; stems usually branched, 4–12 cm tall; leaves 4–12 mm long, 0.5–1.5 mm wide, acute; bracteate leaves 6–10 mm long, 1.5–2.5 mm wide, lanceolate; heads clustered at branch tips, densely woolly; pistillate flowers with bracts boat shaped, densely long-woolly, hyaline margined; staminate flowers with pappus of 3–5 deciduous bristles; achenes ellipsoid, ca 1.5 mm long. Blackbrush, bursage, and indigo bush communities at 915 to 1160 m in San Juan and Washington counties; California to New Mexico, south to Mexico; 3 (i).

SYNTRICHOPAPPUS Gray in Torr.

Annual herbs; stems simple or branched; leaves alternate (or some opposite below), simple, entire or lobed; heads radiate, many, terminating branchlets; involucre sub-cylindric; bracts few, in 1 series, partly enclosing ray achenes; receptacle flat, naked; ray flowers pistillate, fertile, yellow; disk flowers perfect, fertile, yellow; anthers obtuse at base; style branches flattened; pappus of barbellate bristles; achenes 5-angled.

*Syntrichopappus fremontii* Gray Annual herbs, 2–14 cm tall; herbage floccose-tomentose; leaves 5–22 mm long, narrowly spatulate to spatulate, rounded to 3-lobed apically, cuneate basally; heads few to many; involucre 5–6 mm high, 3–4 mm wide; bracts 5, oblong, greenish, with scarious margins, abruptly acute apically; rays 5, yellow, 2–5 mm long; disk corollas numerous, yellow; pappus of white barbellate bristles falling to-

gether. Joshua tree, creosote bush, blackbrush, sagebrush, and juniper communities at 760 to 1375 m in Washington County; California, Nevada, Arizona; 6 (i).

TANACETUM L.

Perennial herbs from a rhizome; leaves alternate, 2- to 3-pinnatifid; heads discoid, numerous, corymbose; flowers perfect; involucre hemispheric; bracts in 2 or 3 series, more or less imbricate, the margins scarious; receptacle low-convex, naked; anthers entire at the base; pappus a minute crown; achenes 5-angled, truncate.

*Tanacetum vulgare* L. Tansy. Aromatic, glabrous or sparingly tomentose perennials, 3–10 (15) dm tall; leaves 6–15 cm long, sessile or subsessile, the blades 2- to 3-pinnatifid; heads many, discoid, yellow; involucre ca 4–5 mm high and 6–10 mm broad; bracts lanceolate; marginal flowers 3-lobed; inner flowers 5-lobed; achenes glandular, 5-angled, ca 1 mm long. Weedy species of disturbed soils at 1370 to 1985 m in Emery, Uintah, and Utah counties; widespread in the U.S.; adventive from Europe; 3 (0).

TARAXACUM Hall.

Perennial scapose herbs with milk juice, from taproots; leaves all basal, pinnatifid to subentire; heads solitary on a scape; involucre bracts in 2 series, herbaceous, the outer shorter, the inner often dilated or appendaged apically, usually with broad hyaline or scarious margins, at least basally; receptacle naked; corollas of ray flowers only, perfect, yellow; pappus of capillary bristles; style branches semicylindric; achenes angular or terete, prominently nerved or ribbed, usually spinulose or with ridges near the body apex, glabrous, beaked.

- 1. Inner involucre bracts commonly dilated or bearing appendages apically, over 10 cm long; plants indigenous, of high elevations ..... *T. ceratophorum*
- Inner involucre bracts usually not dilated or with appendages apically; plants various ..... 2
- 2(1). Outer bracts reflexed or spreading, the inner ones 12–18 mm long; achenes straw colored to olive drab or brownish; plants adventive ..... *T. officinale*
- Outer bracts erect, the inner ones 6–10 mm long; achenes black to grayish; plants indigenous at high elevations ..... *T. lyratum*

*Taraxacum ceratophorum* (Ledeb.) DC. Rough Dandelion. [*Leontodon ceratophorus* Ledeb.]. Plants mostly 4–10 cm tall, from a simple or branched caudex; leaves 4–8 cm long, 0.7–2 cm broad, subentire to toothed; scapes sparingly villous, moderately so below the head; involucre 12–17 mm high in flower, the outer bracts ovate to lanceolate, appressed or ascending, the inner ones lance-oblong, attenuate, the apex dilated or appendaged; rays yellow; achene bodies 3–7 mm long, straw colored to olive-drab or brownish, the beak usually 2–4 times longer than the body; pappus white. Spruce krummholz and sedge-forb meadows at 3230 to 3660 m in Daggett, Duchesne, and Uintah counties (Leidy Peak); Alaska to Yukon, east to the Atlantic, south to California, New Mexico, and Massachusetts; circumboreal; 2 (0).

*Taraxacum lyratum* (Ledeb.) DC. Alpine Dandelion. [*Leontodon lyratus* Ledeb.]. Plants mostly 2–8 cm tall, from a simple or branched caudex; leaves 1–6 cm long, 0.3–1 cm wide, pinnately lobed to pinnatifid or subentire; scapes glabrous or nearly so; involucre 6–10 mm high, the outer bracts lanceolate-ovate, appressed or ascending-spreading, the inner ones lance-oblong to oblong, scarcely or slightly dilated; rays yellow (fading bluish); achene bodies 3–6 mm long, black or grayish, the beak subequal to the body; pappus white. Alpine tundra and meadows in spruce-fir communities at 3325 to 3965 m in Duchesne and Summit counties; Alaska and Yukon, south to Nevada, Arizona, and Colorado; Asia; 5 (i).

*Taraxacum officinale* Weber ex Wiggers Common Dandelion. Plants mostly 3–60 cm tall, from a simple or branched caudex; leaves 5–40 cm long, 1–10 cm wide, pinnately lobed to pinnatifid, the terminal lobe broader than the lateral ones; scapes villous to subglabrous, often moderately to densely villous below the head; involucre 15–25 mm high in flower, the outer bracts lance-acuminate, reflexed, the inner ones lance-attenuate, not or scarcely dilated apically, rarely appendaged; rays yellow, or bluish externally; achene bodies 3–4 mm long, straw colored to olive drab, the beak usually 2–4 times longer than the body; pappus white. Ubiquitous brightly flowered weedy species at 885 to 3205 m throughout Utah; widespread in North America; adventive from Eurasia; 65 (xiii). This handsome plant is among the earliest of our spring flowers, and among the last to bloom in autumn.

#### TETRADYMIA DC.

Armed or unarmed shrubs; stems pannose-tomentose; leaves alternate, entire, foliaceous or modified as spines, with secondary leaves fasciculate in the axils; heads discoid, corymbose or racemose; involucre cylindric to turbinate or hemispheric; receptacle naked; bracts 4–6, equal or nearly so; flowers 4–8, yellow or cream; style branches truncate to rounded or conic apically; anthers sagittate basally; pappus of capillary bristles or barbelate scales; achenes striate.

STROTHER, J. L. 1974. Taxonomy of *Tetradymia* (Compositae: Secenioneae). *Brittonia* 26:177–202.

1. Heads solitary or 2 or 3, axillary; primary leaves modified as spines ..... 2
- Heads several to many in terminal corymbose clusters; primary leaves foliaceous or modified as spines ..... 3
- 2(1). Spines commonly recurved, mainly 5–20 mm long, pannose-tomentose; achenes 6–8 mm long; plants widespread, not of Washington County ..... *T. spinosa*
- Spines straight, mainly 20–40 mm long, glabrescent; achenes 4–5 mm long; plants of Washington County ..... *T. axillaris*
- 3(2). Primary leaves modified as persistent spreading, straight or recurved spines 5–25 mm long ..... *T. nuttallii*
- Primary leaves not modified as persistent spines, if at all spinescent then appressed-ascending ..... 4

- 4(3). Primary leaves linear-subulate, spinescent apically, appressed-ascending, tomentose; secondary leaves obtuse apically, glabrous or essentially so ..... *T. glabrata*  
 — Primary leaves various but not spinescent, not contrasting in shape and pubescence with the secondary ones ..... *T. canescens*

*Tetradymia axillaris* A. Nels. Longspine Horsebrush. Spiny shrubs, mainly 4–12 dm tall; branchlets evenly white-pannose; primary leaves modified as persistent spines 1–5 cm long, straight or becoming curved, tomentose at first, becoming glabrate; secondary leaves linear to spatulate, 2–12 mm long, essentially glabrous; heads solitary or 2 or 3, from nodes of the previous year; involucre 8–11 mm high; bracts 5, subequal, tomentose; flowers 5–7, pale yellow, the corollas 7.5–9 mm long; pappus of slender bristles; achenes 4.5–5.5 mm long; achenes pilose, the hairs 9–11 mm long. Salt and warm desert shrub communities at 850 to 1375 m in Washington County; Nevada and California; 18 (ii). Our material belongs to var. *longispina* (Jones) Strother [*T. spinosa* var. *longispina* Jones, type from St. George].

*Tetradymia canescens* DC. Gray Horsebrush. [*T. linearis* Rydb., type from Iron County]. Unarmed shrubs, mainly 1–9 dm tall; branchlets white-pannose except for glabrate streaks below the primary leaves; primary leaves 0.5–4 cm long, 1–6 mm wide, lanceolate to oblanceolate or spatulate, tomentose; secondary leaves similar to the primary ones but shorter and narrower; heads few to several at branch tips; involucre 6–8 mm high or more; bracts 4, subequal, tomentose; flowers 4, yellow to cream, the corollas 7–11 mm long; pappus of white or tawny bristles; achenes 2.5–5 mm long, glabrous or hairy. Sagebrush-grass, mountain brush, ponderosa pine, mixed conifer, and aspen communities at 1525 to 3150 m throughout Utah; British Columbia to Montana, south to California, Arizona, and New Mexico; 75 (viii).

*Tetradymia glabrata* T. & G. Shrubs, mainly 3–12 dm tall; branchlets pannose except for glabrate or glabrous streaks below the primary leaves; primary leaves mainly 5–15 mm long, 0.8–1.4 mm wide, linear-subulate, spinose tipped, soon deciduous; secondary leaves linear to narrowly spatulate, glabrous or thinly tomentose; heads few to

many on branch tips; involucre 7–10 mm high; bracts 4, subequal, tomentose to glabrous; flowers 4, yellow to cream, the corollas 9–10 mm long; pappus of white bristles; achenes 3–5 mm long, hirsute. Shadscale, greasewood, sagebrush, rabbitbrush, and juniper communities at 1370 to 2370 m in Emery, Juab, Millard, Sanpete, Sevier, Tooele, and Wayne counties; Oregon and Idaho, south to California and Nevada; 44 (v).

*Tetradymia nuttallii* T. & G. Nuttall Horsebrush. Spinescent shrubs, 3–12 dm tall; branchlets white-pannose except for glabrescent streaks below the primary leaf bases; primary leaves modified as persistent straight or recurved spines 5–25 mm long, tomentose to glabrous; heads in terminal clusters of (2) 3–6; involucre 6–9 mm high; bracts 4, equal; flowers 4, yellow, the corollas 8–10 mm long; pappus of white or tawny bristles; achenes 4–6 mm long, hirsute. Shadscale, greasewood, sagebrush-rabbitbrush and pinyon-juniper communities at 1370 to 1830 m in Box Elder, Daggett, Duchesne, Juab, Millard, Tooele, and Uintah counties; Wyoming and Nevada; 25 (i).

*Tetradymia spinosa* H. & A. Spinescent shrubs, 3–12 dm tall; branchlets evenly pannose; primary leaves modified as spines, 5–20 mm long, tomentose, finally glabrate; secondary leaves linear to spatulate, glabrous or glabrescent; heads borne singly or in pairs, laterally, on stems of the previous season; involucre 8–12 mm high; bracts 4–6, subequal, tomentose; flowers 5–8, yellow, the corollas 6–10 mm long; pappus of slender bristles, white; achenes 6–8 mm long, hairy, the trichomes 9–12 mm long. Mixed desert shrub, shrub-grass, and pinyon-juniper communities at 1250 to 1925 m in Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Juab, Millard, Salt Lake, Uintah, and Utah counties; Oregon to Montana and Wyoming, south to California, Nevada, and New Mexico; 15 (vi).



## THELESPERMA LESS.

Perennial glabrous or sparingly puberulent herbs; leaves opposite, pinnately to palmately parted, or the upper ones entire; heads pedunculate, solitary or few per stem; involucre hemispheric to campanulate; bracts in 2 unlike series, the outer ones

spreading and distinct, the inner ones connate to the middle and calyxlike; receptacle flat, chaffy with broad scarious scales; rays present (or lacking), neuter, yellow; disk flowers perfect, fertile; anthers not caudate basally; pappus of 2 retrorsely hispid awns, a crown, or lacking; achenes oblong to linear.

1. Plants 30–80 cm tall; rays normally lacking; pappus of 2 awns; known from San Juan and Washington counties ..... *T. megapotamicum*
- Plants 3–35 cm tall; rays normally present; pappus a crown or none ..... *T. subnudum*

*Thelesperma megapotamicum* (Spreng.) Kuntze Greenthread. [*Bidens megapotamica* Spreng]. Perennial herbs from a caudex and stout root; stems 30–80 cm tall; leaves mainly 2–7 cm long, once or twice pinnatifid, the lobes linear, or the uppermost simple; outer bracts 4–6, oblong to ovate, obtuse, much shorter than the inner; inner bracts 6–12 mm high, connate to above the middle, the lobes with narrow scarious margins; rays lacking; disk flowers yellow (or brownish); pappus of 2 or 3 retrorsely hispid awns; outer achenes somewhat papillose dorsally. Desert shrub community at ca 915 to 1375 m in San Juan and Washington counties; Wyoming to Nebraska, south to Arizona, Texas, and Mexico; 1 (0).

*Thelesperma subnudum* Gray Perennial herbs from a taproot and less commonly with a caudex and creeping rootstock; stems 3–35 cm tall, subscapose; leaves mainly at base of

stem, 1.5–9 cm long, pinnately to subpalmately lobed or some or all of them entire; petioles often ciliate and blades more or less puberulent; involucre 6.3–14 mm high, 9–22 mm wide; outer bracts oblong to lanceolate, with narrow scarious margins, to half as long as the inner ones; inner bracts united to below the middle, conspicuously scarious-margined; rays present and bright yellow, 10–28 mm long and 6–18 mm wide, or lacking; disk flowers yellow; pappus a toothed crown or lacking; achenes glabrous or hairy apically, 3.5–4.5 mm long. This taxon is variable being radiate or discoid, in division of leaves, and in position of leaves along the stem. They occur mainly at elevations below 2135 m elevation. A dwarf alpine phase occurs above that elevation, and because of its small size, lack of rays, and apparent ecotypological differences these plants are herein designated at varietal level.

1. Plants mainly 3–7 cm tall; involucre 6.3–9 mm high, 9–14 mm wide; heads discoid ..... *T. subnudum* var. *alpinum*
- Plants mainly 9–35 cm tall; involucre 8–14 mm high, 12–22 mm wide; heads commonly radiate ..... *T. subnudum* var. *subnudum*

**Var. *alpinum*** Welsh Pinyon-juniper, mountain brush, and western bristlecone pine communities at ca 2745 m in Wayne County; endemic; 2 (0).

**Var. *subnudum*** Mixed desert shrub, salt desert shrub, and pinyon-juniper communities at 1065 to 2135 m in Carbon, Duchesne, Garfield, Grand, Iron (type from Red Creek), Kane, San Juan, Uintah, Washington, and Wayne counties; Colorado, Arizona, and New Mexico; 109 (xiv).

## TOWNSENDIA Hook.

Annual, biennial, or perennial herbs, caulescent or acaulescent; leaves alternate, entire or rarely lobed or toothed; heads radiate, solitary or few, terminating branches, or sessile; receptacle convex, naked; involucre campanulate to hemispheric; bracts in 2–7 series; rays pistillate, fertile, the corollas white, pink, or yellow; disk flowers perfect, yellow; disk pappus of barbellate capillary bristles; ray pappus similar to that of the disk

or shortened; achenes 2- or 3-ribbed, compressed, usually hairy.  
BEAMAN, J. H. 1957. The systematics and evolution of *Townsendia* (Compositae).

Contr. Gray Herb. 183:1-151.  
REVEAL, J. L. 1970. A revision of the Utah species of *Townsendia* (Compositae). Great Basin Nat. 30:23-52.

- 1. Plants caulescent, the internodes apparent, annual or biennial (short-lived perennial) ..... 2
- Plants acaulescent, the internodes not elongating, perennial ..... 5
- 2(1). Plants annual or winter annual; disk pappus shorter than disk-corollas; plants of southeastern Utah (Navajo Basin) ..... *T. annua*
- Plants biennial or short-lived perennials; disk pappus subequal to or longer than the disk corollas ..... 3
- 3(2). Achenial hairs unevenly branched; ray flowers usually dark pink-purple dorsally; plants biennials of western Utah ..... *T. florifer*
- Achenial hairs glochidiate; ray flowers variously colored, but if dark pink-purple dorsally then the plants perennial and of different distribution ..... 4
- 4(3). Stems gray-white, the pubescence dense; plants of broad distribution, perennial ..... *T. incana*
- Stems thinly strigose, evident beneath the hairs; plants of the Uinta Basin, biennial ..... *T. strigosa*
- 5(1). Involucral bracts linear to narrowly lanceolate, in 5-7 series ..... 6
- Involucral bracts lanceolate to ovate or elliptic, in 2-5 series ..... 9
- 6(5). Involucral bracts hair tufted apically, linear, acuminate; plants of Carbon, Duchesne, and Daggett counties ..... *T. hookeri*
- Involucral bracts not hair tufted apically, narrowly lanceolate, acute; plants variously distributed ..... 7
- 7(6). Rays glandular dorsally; leaves canescent; plants of Duchesne and Uintah counties ..... *T. mensana*
- Plants glabrous or sparingly pubescent dorsally; leaves greenish or grayish-canescenscent; plants not or seldom of Duchesne and Uintah counties ..... 8
- 8(7). Disk pappus 3-6 mm long; leaves green, the midveins not conspicuous; plants of the Wasatch Plateau and Uinta Mountains ..... *T. leptotes*
- Disk pappus 6-11 mm long; leaves grayish canescent, the midveins conspicuous; plants of Sevier, Iron, Wayne, and Garfield counties ..... *T. exscapa*
- 9(5). Rays yellow ventrally, densely glandular and often purplish dorsally; ray pappus 1-2 mm long; plants of Emery and eastern Sevier counties ..... *T. aprica*
- Rays white or pink or bluish, or rarely yellow ventrally, but, if yellow, the ray pappus 2-4.5 mm long and plants of other distribution ..... 10
- 10(9). Plants green or greenish; flowers often bluish or purplish to pink, mainly of higher elevations in mountains and plateaus ..... *T. montana*
- Plants grayish canescent or whitish; flowers seldom bluish or purplish, usually white to pink or yellowish ventrally; mainly of low elevations ..... 11
- 11(10). Involucral bracts sparingly strigose; ray pappus 2-4.5 mm long; plants mainly of western Utah ..... *T. jonesii*
- Involucral bracts moderately strigose; ray pappus 0.3-0.6 mm long; plants mainly of eastern Utah ..... *T. incana*

*Townsendia annua* Beaman Caulescent annual or winter annual herbs, 2–18 cm tall; herbage strigose; leaves of basal rosettes soon withered or poorly developed; cauline leaves 5–28 mm long, 1–5 mm wide, oblanceolate to spatulate or linear, sparingly to moderately strigose, green or greenish; heads solitary or few; involucre 4.5–7 mm long, 6–14 mm wide; bracts in 2–4 series, green or suffused with purple, scarious, ciliate; rays 13–34, the corollas white or pink to lavender, 4–8 mm long, 1–2.3 mm wide, glabrous; disk corollas yellow, 2.2–3.5 mm long; achenes 1.9–2.6 mm long, pubescent with glochidiate hairs; ray pappus 0.2–0.8 mm long, that of disk flowers 1.8–3 mm long. Sandy desert shrub and blackbrush communities at 1125 to 1590 m in Carbon, Emery, Garfield, Grand, Kane, and San Juan counties; Colorado, Arizona, New Mexico, and Texas; 23 (v).

*Townsendia aprica* Welsh & Reveal Pulvinate-caespitose acaulescent perennial herbs from a caudex, 1.5–2.5 cm tall; leaves 7–13 (16) mm long, 1–3.5 mm wide, spatulate to oblanceolate, strigose; heads sessile, submerged in the leaves; involucre 4–8 mm high, 7–13 mm wide; bracts in 3–4 series, lanceolate, fimbriate, red-scarious, hyaline-ciliate, the outermost sparsely strigose; rays 13–21, the corollas yellow to golden ventrally, purplish dorsally and glandular, 4–7 mm long; disk corollas yellow, 3.7–4.5 mm long; achenes 2–2.5 mm long, 2-ribbed, the hairs glochidiate; ray pappus 0.7–1 mm long; pappus of disk flowers 4–5 mm long. Salt desert shrub and pinyon-juniper communities, commonly on clay or clay-silt exposures of the Mancos Shale (Blue Gate Member), at 1860 to 2440 m in Emery and adjacent Sevier (type from south of Fremont Junction) counties; endemic; 10 (ii). The yellow flowers and short pappus of ray flowers are diagnostic.

*Townsendia exscapa* (Richards.) T.C. Porter [*Aster?* *exscapa* Richards.]. Caespitose acaulescent perennial herbs from a simple or branched caudex, 2–3.5 cm high; leaves 0.6–5 cm long, 1–3.5 mm wide, oblanceolate to linear, acute and mucronate apically, strigose, with midvein apparent; involucre 10–18 mm high, 15–30 mm wide; bracts in 4–7 series, linear to narrowly lanceolate, ciliate on scarious margins, sparingly strigose to

glabrous; ray flowers 21–40, the corollas white or pinkish, 8–15 mm long, 1.2–3 mm wide; disk corollas yellow; achenes 2- or 3-ribbed, pubescent with glochidiate hairs; ray pappus 4–8 mm long; disk pappus 6–12 mm long. Ponderosa pine, mountain sagebrush, and spruce-fir communities, often in meadows, at 2135 to 3295 m in Garfield, Iron, Sevier, and Wayne counties; British Columbia to Manitoba, south to Nevada, Arizona, Mexico, and Texas; 8 (ii).

*Townsendia florifer* (Hook.) Gray [*Eriogon?* *florifer* Hook.; *T. watsonii* Gray, type from Stansbury Island; *T. scapigera* var. *ambigua* Gray, type from Rabbit Valley; *T. florifer* var. *communis* Jones, type from Marysville]. Caulescent winter annual or biennial herbs 3–20 cm tall; basal leaves 6–50 mm long, 3–12 mm wide, spatulate; cauline leaves narrowly oblanceolate to linear, 10–40 mm long, 1–5 mm wide, strigose, petiolate, grayish; heads solitary or few; involucre 6.5–13 mm high, 15–30 mm wide; bracts in 3 or 4 series, green or suffused with purple, scarious, ciliate; rays 13–34, the corollas white or pink ventrally, dark pink or lavender dorsally, 7–12 mm long, 1.2–3 mm wide, often glandular; disk corollas yellow, 3.3–6 mm long; achenes 3.3–4.5 mm long, pubescent with unequally forked hairs; ray pappus 1–6 mm long; disk pappus 3.5–7.5 mm long. Mixed desert shrub communities at 1280 to 1985 m in Beaver, Box Elder, Garfield, Juab, Millard, Sanpete, Sevier, Tooele, Utah, and Wayne counties; Washington to Idaho, Oregon, and Nevada; 56 (vii).

*Townsendia hookeri* Beaman Caespitose acaulescent perennial herbs from a simple or branched caudex, 2.5–3.5 cm high; leaves 10–40 mm long, 1–2.5 mm wide, linear to linear-oblanceolate, strigose; involucre 9–13 mm high, 9–14 mm wide; bracts in 5–7 series, linear to lance-linear, tufted-hairy apically, green or suffused with purple, strigose; rays 13–34, the corollas 6–9 mm long, 1–1.9 mm wide, white or pink ventrally, pinkish dorsally, glabrous; disk corollas yellow, 4.5–6 mm long; achenes 3.5–4.5 mm long, pubescent with glochidiate hairs; ray pappus 1–1.5 mm long; disk pappus 5.5–8.5 mm long. Sagebrush, sagebrush-grass, and mixed conifer communities at 2165 to 2716 m in Carbon, Daggett, Duchesne, and Uintah



counties; Yukon to Saskatchewan, south to South Dakota and Colorado; 5 (0).

*Townsendia incana* Nutt. [*T. incana* var. *ambigua* Jones, type from Thompson]. Subcaulescent to acaulescent caespitose herbs, the caudex often branched; stems conspicuously white strigose, mainly 2–6 cm high, forming clumps to 2 dm wide; leaves 5–40 mm long, 1–5 mm wide, spatulate to oblanceolate, strigose; heads solitary or few; involucre 7–11 mm high, 8–20 mm wide; bracts in 3 or 4 series, lanceolate, green, the margins scarious and ciliate, strigose; rays 13–34, the corollas white ventrally, pink to lavender dorsally, 6–10 mm long, 1.5–3 mm wide; achenes 2.5–4.5 mm long, pubescent with glochidiate hairs; ray pappus 0.3–0.6 mm long; disk pappus 4–7.5 mm long. Blackbrush, salt desert shrub, mixed desert shrub, pinyon-juniper, and sagebrush communities at 1310 to 2290 m in Beaver, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Kane, Piute, San Juan, Sevier, Uintah, and Wayne counties; Wyoming to Nevada, Arizona, and New Mexico; 183 (xxiii). This is

the common townsendia of the Colorado drainage system in Utah; its Great Basin counterpart is *T. jonesii*, from which it can be distinguished by the white strigose stems and shorter ray pappus.

*Townsendia jonesii* (Beaman) Reveal [*T. mensana* var. *jonesii* Beaman, type from Mammoth]. Subcaulescent to acaulescent caespitose herbs, the caudex commonly branched; stems not conspicuously white strigose, mainly 2–4 cm tall, forming clumps to 1 dm wide; leaves 10–40 mm long, 1–4 mm wide, oblanceolate to spatulate or almost linear, strigose; heads mostly solitary; involucre 9–12.5 mm high, 8–14 mm wide; bracts in 4 or 5 series, lanceolate, green or suffused purple, sparsely strigose; rays 13–21, the corollas white to pink, cream, or yellow ventrally, pink to red-purple dorsally, glandular, 4–7 mm long; disk corollas yellow, ca 3.5 mm long; achenes 3–5.5 mm long; pubescent with glochidiate hairs; ray pappus 2–4.5 mm long; disk pappus 5–8 mm long. Two weak, but geographically and edaphically correlated, varieties are present.

- 1. Ray flowers yellow to lemon-yellow ventrally; plants of gypsiferous substrates in Sevier and Piute counties ..... *T. jonesii* var. *lutea*
- Ray flowers pink to white or cream ventrally; plants of various substrates, rather broadly distributed ..... *T. jonesii* var. *jonesii*

Var. *jonesii* Sagebrush, shadscale, rabbitbrush, pinyon-juniper, mountain brush communities at 1525 to 2745 m in Beaver, Juab, Millard, Sanpete, and Sevier counties; Nevada; 13 (ii). The type of *T. mensana* var. *jonesii* consists of strictly acaulescent plants with very slender leaves and smallish heads; it is unmatched in the specimens examined, and it is understandable why the taxon was placed initially with *T. mensana*.

Var. *lutea* Welsh Salt desert shrub and juniper communities at ca 1675 to 1830 m in Sevier and Piute counties (on Arapien shale and clays in volcanic rubble); endemic; 6 (i).

*Townsendia leptotes* (Gray) Osterh. [*T. sericea* var. *leptotes* Gray]. Perennial acaulescent herbs from a simple or more commonly branched caudex, 1–3 cm tall; herbage sparingly strigose, greene; leaves 0.6–4 cm long, 1.3–2.6 mm wide, linear to narrowly oblanceolate; involucre 5–10 mm high, 9–14 mm wide; bracts in 4–7 series, lanceolate to lin-

ear, the margins scarious, ciliate, often suffused purple; rays 13–34, the corollas white, cream, or pink ventrally, sometimes lavender dorsally, 6–10 mm long, 1.2–2 mm wide; disk corollas yellow, 3–5 mm long; achenes pubescent with glochidiate hairs; ray pappus 0.8–6.5 mm long; disk pappus like the ray pappus. Montane sagebrush and grass-forb communities, often on ridge crests and plateau margins at 2680 to 3145 m in Duchesne, Sanpete, and Summit counties (Uinta Mountains and Wasatch Plateau); Idaho and Montana, south to California, Nevada, and New Mexico; 7 (0).

*Townsendia mensana* Jones Perennial acaulescent herbs from a simple or more commonly branched caudex 1–2.5 cm high; herbage strigose; leaves 3–17 mm long, 0.6–1.3 mm wide, narrowly oblanceolate to linear; involucre 5–9 mm high, 7–10 mm wide; bracts in 4 or 5 series, lanceolate, the margin scarious and ciliate; rays 13–21, the corollas whitish, cream, or pinkish, glandular

dorsally, 5–7.5 mm long, 0.9–1.4 mm wide; disk corollas yellow, 3.5–4.8 mm long; achenes pubescent with glochidiate hairs; ray pappus 2.5–4 mm long; disk pappus 5–6.5 mm long. Salt desert shrub, pinyon-juniper, and sagebrush communities, especially on barren and semibarren sites, at 1705 to 2715 m in Duchesne (type from near Duchesne, then Theodore) and Uintah counties; Colorado (?); a Uinta Basin endemic; 38 (v).

***Townsendia montana* Jones** Perennial acaulescent or rarely subcaulescent herbs from a simple or branched caudex, sometimes with soboliferous rhizomatous branches, from

a taproot, 2–6 cm high; herbage glabrate to strigose; leaves 5–40 mm long, 2–8 mm wide, spatulate, thickish; involucre 6–12 mm high, 8–20 mm wide; bracts in 3–6 series, oblong, obovate, oblanceolate or lanceolate, glabrous or sparingly strigose, the margins scarious; ciliate, often suffused with purple; rays 12–30, the corollas blue, pink, lavender, or white, 6–12 mm long, 1–3.5 mm wide; achenes 3.7–5.2 mm long, glabrous or sparingly pubescent with bifurcate or glochidiate hairs; ray and disk pappus alike, 3–5.5 mm long. Three more or less distinctive varieties are present.

1. Heads usually sessile; leaves mainly 1–3.5 mm wide, rather abruptly obtuse apically; plants of Garfield and Kane counties ..... *T. montana* var. *minima*
- Heads usually at least shortly pedunculate; leaves mainly broader (at least some), rounded to obtuse; plants not of Garfield or Kane counties ..... 2
- 2(1). Leaves rounded apically, broadly spatulate; plants of calciferous outcrops in southern Duchesne, Wasatch, and Sanpete counties ..... *T. montana* var. *caelilinensis*
- Leaves obtuse to subacute apically; plants of various substrates in the Uinta and Wasatch mountains ..... *T. montana* var. *montana*

**Var. *caelilinensis* Welsh** Pinyon-juniper, spruce-fir, and limber pine communities on Flagstaff Limestone and Green River formations at 2135 to 3735 m in southern Duchesne, Wasatch, and Sanpete counties; endemic; 13 (i).

**Var. *minima* (Eastw.) Beaman** [*T. minima* Eastw., type from Bryce Canyon]. Ponderosa pine, western bristlecone, limber pine, and Douglas fir–white fir communities, on white and pink members of the Cedar Breaks Formation, at 2375 to 3115 m in Garfield and Kane counties; endemic; 14 (i).

**Var. *montana* [T. dejecta A. Nels., type from Dyer Mine].** Spruce-fir and lodgepole pine communities at 3050 to 3510 m in Cache, Juab, Salt Lake (type from Alta), Summit, and Uintah counties; Idaho, Montana, and Wyoming; 2 (0).

***Townsendia strigosa* Nutt.** Caulescent biennial herbs; stems branched from the base and above, 3–15 cm long; herbage strigose to strigulose; basal leaves 1.2–4.5 cm long, 1.2–7 mm wide, oblanceolate to spatulate, more or less persistent; cauline leaves mostly smaller and narrower, often clustered below and overtopping the heads; involucre 5–10 mm

high, 7–20 mm wide; bracts in 3 or 4 series, lance-ovate to lanceolate, the margins scarious, ciliate, strigose; rays 12–30, the corollas white to pink, sometimes darker dorsally, 5–14 mm long, 1.5–3 mm wide; disk corollas 3.3–5 mm long; achenes pubescent with glochidiate hairs; ray pappus 0.5–1.6 mm long; disk pappus 3.3–5 mm long. Salt desert shrub, mixed desert shrub, and pinyon-juniper communities at 1460 to 1895 m in Daggett, Duchesne, and Uintah counties; Wyoming; 14 (ii).

#### TRAGOPOGON L.

Biennial (annual or perennial) herbs from thickened taproots, the juice milky; leaves alternate, entire, clasping basally; heads solitary or few and corymbose; flowers all ray-like, perfect, yellow or purple; involucre cylindric or campanulate; bracts uniseriate, equal; receptacle naked; pappus of plumose bristles united at the base; achenes 5- to 10-nerved, slender-beaked or the outer beakless.

OWNBEY, M. 1950. Natural hybridization and amphiploidy in the genus *Tragopogon*. Amer. J. Bot. 37:487–499.

1. Peduncles scarcely if at all inflated, even in fruit; achenes 15–25 mm long (including the beak); bracts subequal to the rays; plants rare in Utah ..... *T. pratensis*
- Peduncles strongly inflated apically; achenes 25–36 mm long (including the beak); bracts usually longer than the rays; plants locally common ..... 2
- 2(1). Rays purple; involucre bracts mainly 8 or 9 ..... *T. porrifolius*
- Rays yellow; involucre bracts usually 13 ..... *T. dubius*

*Tragopogon dubius* Scop. Biennial herbs; stems erect, 3–10 dm tall, simple or branched; leaves mainly 5–25 cm long, linear-subulate from an expanded base, floccose, becoming glabrate; peduncles enlarged and fistulous below the heads; involucre cylindric to campanulate; bracts commonly 13 (8 on later heads), 2.5–4 cm long in flower, 4–7 cm long in fruit; rays pale lemon yellow, shorter than the bracts; achenes 25–36 mm long; pappus whitish to tawny. Disturbed soils and in low quality range sites at 1370 to 3205 m in all Utah counties; widely distributed in the U.S.; adventive from Europe; 58 (vi).

*Tragopogon porrifolius* L. Oyster-plant; Salsify. Biennial herbs; stems erect, 3–10 dm tall, simple or branched above; leaves mainly 5–30 cm long, linear-subulate, the apex not recurved; peduncles enlarged and fistulous below the heads; involucre cylindric to campanulate; bracts commonly 8 (5–11), 2.5–4 cm long in flower, 4–7 cm long in fruit; rays purple, subequal to or shorter than the bracts; achenes 25–35 mm long; pappus brownish. Cultivated plants, escaping and persisting on canal banks, in moist meadows, and along roadsides at 1370 to 2595 m in Carbon, Millard, Salt Lake, Sanpete, Summit, and Weber counties; widespread in much of the U.S.; introduced from Europe; 10 (0).

*Tragopogon pratensis* L. Biennial herbs; stems erect, 1.5–8 dm tall, simple or branched; leaves mainly 5–30 cm broad, tapering from a broadly expanded base to 2 cm wide, recurved apically; peduncles not especially enlarged in flower or in fruit; involucre campanulate; bracts commonly 8, 12–24 mm long in flower, 18–38 mm long in fruit; rays chrome-yellow, equaling or surpassing the bracts; achenes 15–25 mm long; pappus off-white. Disturbed sites in Rich, Salt Lake, and Summit counties; widespread in the U.S.; adventive from Europe; 2 (0).

#### VANCLEVEA Greene

Shrubs; branchlets glutinous-resinous, green to tan, finally white to gray barked;

leaves alternate, sessile, entire or serrate, falcately curved; heads discoid, yellow, solitary or cymose; involucre campanulate; bracts in 4 or 5 series, imbricate, glutinous; receptacle naked, resinous; styles long-exserted, the branches flattened, papillose; achenes clavate, 5-angled; pappus of 12–16 linear persistent slender scales.

*Vancleavea stylosa* (Eastw.) Greene [*Grindelia stylosa* Eastw., type from San Juan County]. Shrubs, mainly 5–12 dm tall; branchlets glutinous-resinous; bark tan to white or grayish black in age; leaves 0.6–3.5 cm long, 1–9 mm wide, narrowly lanceolate to oblong or elliptic, commonly entire, attenuate to a spinulose tip; heads solitary or more commonly few to many in corymbose or cymose clusters; involucre 8–10 mm high, 9–15 mm wide; bracts lanceolate to lance-attenuate, sometimes abruptly acuminate and recurved apically, resin coated; corollas yellow to cream, 6–7 mm long; achenes 4–5 mm long, compressed, glutinous and spreading hairy. Four-wing saltbush, ephedra, sand dropseed, Indian ricegrass, blackbrush, and juniper communities, in sand, at 1125 to 1620 m in Emery, Garfield, Grand, Kane, San Juan, and Wayne counties; Arizona (a Colorado Plateau endemic); 32 (viii). The genus is monotypic.

#### VERBESINA L.

Annual (biennial or perennial?) herbs; leaves opposite, at least below, simple, toothed; heads radiate, showy; involucre biseriate, about equal, herbaceous; receptacle convex, chaffy, the bracts enfolding the achenes; rays yellow or yellow-orange, pistillate; disk flowers perfect, fertile; anthers subtire basally; style branches with hispidulous appendages; pappus of 2 slender awns; achenes flattened, 2-winged.

*Verbesina encelioides* (Cav.) Benth. [*Ximenesia encelioides* Cav.]. Annual herbs; stems 4–10 dm tall, cinereous-strigose, often



branched above; lowest leaves opposite, alternate upward, petiolate, often with stipule-like appendages at base; blades 1.2–10 cm long, 0.7–6 cm wide, ovate to lanceolate, acute to attenuate, irregularly toothed, strigose beneath, green and sparingly strigose above; involucre 7–12 mm high, 15–25 mm wide; bracts lance-ovate to lance-linear, herbaceous, strigose; rays 10–15, yellow or yellow-orange, 8–20 mm long; pappus of 2 short slender awns; achenes thickly 2-winged, pubescent. Sagebrush, rabbitbrush, saltgrass, pinyon-juniper, and ponderosa pine communities, often in disturbed sites, at 1280 to 2260 m in Beaver, Garfield, Juab, Kane, San Juan, and Washington counties; Montana to California and Texas; 20 (v). Most of our material belongs to var. *exariculata* Robins. & Greenm. The bright flowers contrast sharply

with the grayish-strigose pubescence, resulting in a strikingly beautiful plant.

#### WYETHIA Nutt.

Perennial herbs from thick taproots; stems erect or ascending; leaves alternate, simple; heads large, solitary or several, radiate; involucre bracts in 2–4 series, herbaceous or coriaceous; receptacle convex, chaffy, the bracts folded, persistent; rays yellow, pistillate, fertile; disk flowers perfect, yellow; pappus a crown of scales or lacking; achenes trigonal or 4-angled, glabrous or pubescent.

WEBER, W. A. 1946. A taxonomic and cytological study of the genus *Wyethia*, family Compositae, with notes on the related genus *Balsamorhiza*. Amer. Midl. Nat. 35:400–452.

1. Leaves mainly cauline, the basal reduced or lacking, scabrous-roughened; plants of sandy desert shrublands ..... *W. scabra*
- Leaves basal and cauline, the basal often larger than the cauline ones, smooth or, if rough-hairy, not of lower elevations ..... 2
- 2(1). Herbage glabrous, resinous; upper leaves rounded and clasping basally ..... *W. amplexicaulis*
- Herbage hirsute to glabrate; upper leaves petiolate ..... *W. arizonica*

***Wyethia amplexicaulis* (Nutt.) Nutt.** Mulesears. [*Espeletia amplexicaulis* Nutt.]. Perennial herbs; stems mostly 2.5–9 dm tall, glabrous; basal leaves 12–40 cm long, 2–15 cm wide, entire or dentate, petiolate, resinous; cauline leaves smaller, sessile, rounded and clasping basally; heads large, solitary or several; involucre hemispheric, 25–35 mm high, 25–50 mm wide; outer bracts foliaceous, subequal; rays 6–16, yellow, 2.5–4.5 cm long; pappus a crown, sometimes prolonged into filiform awns; achenes 8–10 mm long, glabrous. Sagebrush, oak, pinyon-juniper, aspen-fir, and forb-grass communities at 1525 to 2745 m in Box Elder, Cache, Juab, Millard, Morgan, Salt Lake, Sanpete, Sevier, Summit, Tooele, Utah, Weber, and Washington counties; Washington to Montana, south to Nevada and Colorado; 38 (ii).

***Wyethia arizonica* Gray** Perennial herbs; stems mainly 30–80 cm tall, spreading hairy, especially upward; basal leaves 15–40 cm long or more, 3–15 cm wide, petiolate, the blades oblanceolate to elliptic or lanceolate;

cauline leaves smaller, attenuate basally to a short petiole; heads large, solitary or several; involucre hemispheric or campanulate, 20–30 mm high, 15–40 mm wide; outer bracts foliaceous, subequal; rays 6–16, yellow, 2.5–4 cm long; pappus a crown, sometimes prolonged into filiform awns; achenes 8–10 mm long, glabrous. Pinyon-juniper, oak, and ponderosa pine communities at 1430 to 2440 m in Grand, Kane, San Juan, and Washington counties; Colorado, New Mexico, and Arizona; 9 (0).

***Wyethia scabra* Hook.** Robust, clump-forming perennial herbs; stems several to many, 1.5–6 dm high or more, scabrous and hispidulose; leaves mainly cauline, the lower ones rudimentary, 3–15 cm long, 3–17 mm wide, elliptic to oblong or linear, scabrous; heads solitary or few, terminating stems and branches; involucre hemispheric, 20–40 mm high, 20–55 mm wide; bracts lanceolate to linear, attenuate to caudate-attenuate; rays 10–23, yellow, 18–40 mm long; pappus a crown; achenes 6–8 mm long, glabrous.

Three more or less distinctive varieties are present. Diagnostic features are based on the nature of surface and habit of the involucrel

bracts, which in the typical, common phase is almost sufficiently variable as to include the others.

- 1. Involucrel bracts long-attenuate from short dilated bases, ciliate with multicellular hairs, glabrous but with shiny resin droplets dorsally; plants of Kane County ..... *W. scabra* var. *attenuata*
- Involucrel bracts variable in shape, ciliate or not, scabrous to pubescent and more or less glandular dorsally, but seldom if ever with resin droplets ..... 2
- 2(1). Involucrel bracts closely imbricate, the outer recurved-spreading, pubescent with short fine hairs; plants of San Juan, Grand, and eastern Kane counties ..... *W. scabra* var. *canescens*
- Involucrel bracts various, scabrous to long-hairy dorsally; plants rather widely distributed ..... *W. scabra* var. *scabra*

**Var. *attenuata* W. A. Weber** Ponderosa pine, oak, and pinyon-juniper (less commonly in desert shrub) communities, in sand, at 1370 to 1985 m in Kane County (type from north of Kanab); Arizona; 13 (iii). This handsome plant is a botanical motif of the Coral Pink dunes area, and is also present on East Clark Bench.

**Var. *canescens* W. A. Weber.** Warm desert shrub and mixed desert shrub communities at 1125 to 1680 m in Grand, Kane, and San Juan counties; Colorado, Arizona, and New Mexico; 4 (i). This is a variable entity transitional to the typical variety, especially in Grand and eastern Kane counties.

**Var. *scabra* Bläckbrush, vancleveaephedra,** other mixed desert shrub, pinyon-juniper, and ponderosa pine communities at 1220 to 2625 m in Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Kane, and Uintah counties; Wyoming; 48 (vii).

XANTHIUM L.

Annual herbs with fleshy large cotyledons and a taproot; leaves alternate, petiolate, the blades broad, rough-hairy; heads unisexual, discoid, or the corolla lacking; staminate heads uppermost, many flowered; involucrel bracts in 1-3 series, separate; receptacle cylindrical, chaffy; filaments monadelphous, the anthers separate; pistil vestigial, the styles unbranched; involucre of pistillate heads enclosing the 2 flowers, forming a 2-chambered bur armed with hooked prickles, the corolla lacking; achenes large, solitary in each chamber; pappus none.

***Xanthium strumarium* L.** Cocklebur. [*X. italicum* Moretti; *X. pensylvanicum* Wallr.]. Annual monoecious herbs; stem 1.5-10 dm tall or more, simple or branched, scabrous, often purple mottled; leaves petiolate, the blades mainly 2-12 cm long and about as broad, ovate to oval or orbicular, obtuse to cuneate or cordate basally, scabrous, dentate and often lobed; heads in few to many short axillary clusters; burs broadly cylindric to ovoid, 1-3.5 cm long, with 2 more or less incurved beaks apically, covered with stout hooked prickles. Weedy species of cultivated and other disturbed lands, at 850 to 1925 m in much of Utah; adventive (?) from the eastern U.S. or possibly from Europe; 33 (iii). The seedlings are poisonous to livestock, and they produce dermatitis in some people.

XYLORHIZA Nutt.

Subshrubs or suffrutescent perennial herbs; branchlets green to straw colored or whitish; leaves alternate, simple; heads solitary at branch ends; involucrel campanulate to hemispheric; bracts imbricate in several series, herbaceous to largely scarious, erect; ray flowers pistillate, fertile, yellow; achenes somewhat compressed, hairy; pappus of tawny to whitish capillary bristles. **Note:** Members of this genus are all primary or secondary selenium indicators.

**CRONQUIST, A. AND D. D. KECK.** 1957. A reconstitution of the genus *Machaeranthera*. *Brittonia* 9:231-239.

**WATSON, T. J.** 1977. The taxonomy of *Xylorhiza* (Asteraceae-Astereae). *Brittonia* 29:199-216.

1. Leaves linear to linear-filiform, the margins entire and more or less involute; plants of Kane and Garfield counties ..... *X. confertifolia*
- Leaves serrate to serrate-dentate, or, if entire, of other distribution (except *X. cronquistii*) ..... 2
- 2(1). Leaves serrate to serrate-dentate (at least some); plants of south central and southwestern Utah, and of canyons of the Colorado ..... 3
- Leaves entire; plants of eastern Utah ..... 4
- 3(2). Leaves only sparingly serrate, linear-oblongate to elliptic; involucre bracts shortly attenuate, short-villous dorsally; plants of north central Kane County ....  
..... *X. cronquistii*
- Leaves sharply serrate-dentate, narrowly oblanceolate, elliptic, oblong, or lanceolate; involucre bracts long-attenuate, glandular or villous-pilose dorsally; plants of canyons of the Colorado and southwestern Utah ..... *X. tortifolia*
- 4(2). Peduncles mainly less than 5 cm long; stems usually leafy to much above the middle ..... *X. glabriuscula*
- Peduncles mainly more than 5 cm long; stems usually to the middle or below ...  
..... *X. venusta*

*Xylorhiza confertifolia* (Cronq.) T.J. Watson [*Machaeranthera glabriuscula* var. *confertifolia* Cronq., type from NE of Henrieville]. Perennial herbs from a woody caudex and taproot, with rootstocks sometimes developed; stems 9–23 cm high, sparingly pilose to glabrate and sparingly to densely stipitate-glandular; leaves 1–4.5 cm long, 1–2.5 mm wide, linear, pilose to glabrate, commonly involute; peduncles 1.8–14 cm long; involucre 9–12 mm high, 12–18 mm wide; bracts lanceolate to lance-acuminate, pilose to glabrate and glandular; rays 4–12, white, 9–18 mm long, 2–4 mm wide; disk flowers yellow, the corollas 6–9 mm long; pappus of capillary bristles to 6.5 mm long; achenes 3.5–6 mm long, pubescent. Salt desert shrub and pinyon-juniper communities at 1675 to 1985 m in Garfield and Kane counties; endemic; 6 (i).

*Xylorhiza cronquistii* Welsh & Atwood in Welsh Cronquist Woody-aster. Subshrubs, forming rounded clumps, from a stout taproot; stems numerous, whitish, ca 30 cm tall, villous at the nodes, almost glabrous otherwise; leaves 2.5–5 cm long, 2.5–5 mm wide, linear-lanceolate, sparingly serrate-dentate to

entire, sparsely villous, ciliate, the midrib prominent; heads solitary on branches; involucre 10–12.5 mm high, 13–19 mm wide; bracts oblanceolate to lance-attenuate, acute to acuminate, herbaceous above the middle, chartaceous below, short-villous and glandular dorsally; rays white, 14–16, 20–25 mm long; achenes compressed, villous; pappus of capillary bristles to 7.2 mm long. Pinyon-juniper community, on the Kaiparowits Formation, at 1890 to 2075 m in Kane County; endemic; 1 (0).

*Xylorhiza glabriuscula* Nutt. Subshrubs or suffrutescent perennial herbs from a woody caudex and taproot; stems 7–37 cm tall, villous to glabrous; leaves 1–7.5 cm long, 1–9 mm wide, villous to glabrate, lanceolate to narrowly lanceolate or oblanceolate; heads solitary at branch ends; involucre 9–13 mm high, 15–27 mm wide; bracts lanceolate, attenuate to acute or acuminate, herbaceous above the middle, scarious below, villous to glabrous; rays 10–22, white to bluish or purplish, 11–20 mm long; achenes compressed, villous; pappus of capillary bristles to 5 mm long. Two allopatric varieties are present.

1. Leaves with attenuate bases; rays white; plants of Daggett County .....  
..... *X. glabriuscula* var. *glabriuscula*
- Leaves with truncate or rounded bases; rays bluish, purplish, or white; plants of San Juan County ..... *X. glabriuscula* var. *linearifolia*



**Var. *glabriuscula*** [*Aster glabriuscula* (Nutt.) T. & G.; *Machaeranthera glabriuscula* (Nutt.) Cronq. & Keck]. Salt and mixed desert shrub communities at ca 1525 to 2135 m in Daggett County; Colorado, Montana, South Dakota, and Wyoming; 0 (0).

**Var. *linearifolia*** T.J. Watson Salt desert shrub community, mainly on Chinle and Moenkopi formations, in Grand and San Juan counties; endemic; 3 (iii).

***Xylorhiza tortifolia*** (T. & G.) Greene Subshrubs; stems 15–50 cm tall or more, villous or tomentose and more or less stipitate-

glandular; leaves 1–10 cm long, 4–20 mm wide, lanceolate to elliptic or oblanceolate, villous to tomentose and glandular, spinulose-dentate; heads terminating branches; involucre mainly 12–20 mm high and 15–30 mm wide; bracts narrowly lance-attenuate to -acuminate, herbaceous above, scarious below; rays 17–60 or more, bluish or purplish to white, 10–33 mm long, 1.8–5.5 mm wide; pappus of capillary bristles to 9 mm long; achenes compressed, pilose. Two varieties are present.

- 1. Involucre merely glandular dorsally; plants of canyons of the Colorado ..... *X. tortifolia* var. *imberbis*
- Involucre villous-pilose as well as glandular; plants of Washington County ..... *X. tortifolia* var. *tortifolia*

**Var. *imberbis*** (Cronq.) T.J. Watson [*Machaeranthera tortifolia* var. *imberbis* Cronq.]. Blackbrush, pinyon-juniper and sagebrush communities at 1220 to 2290 m in Garfield, Grand, Kane, San Juan, and Wayne counties; Arizona (Colorado canyons endemic); 32 (viii).

**Var. *tortifolia*** [*Haplopappus tortifolius* T. & G.; *Aster abatus* Blake; *Machaeranthera tortifolia* (T. & G.) Cronq. & Keck]. Blackbrush and other warm desert shrub communities at 760 to 1010 m in Washington County; Arizona, Nevada, and California; 10 (i).

***Xylorhiza venusta*** (Jones) Heller [*Aster venustus* Jones, type from Cisco]. Suffrutescent to herbaceous perennial herbs from a

woody caudex and taproot; stems mainly 10–40 cm tall, glabrous to densely pilose; leaves 2.4–9 cm long, 2–17 mm wide, oblanceolate to spatulate, villous to glabrate, attenuate basally; heads terminating branches; peduncles 5–20 cm long; involucre 10–18 mm high, 18–50 mm wide; bracts lance-attenuate to caudate-acuminate, herbaceous above, scarious below; rays 12–36, white or bluish to purplish, 12–27 mm long; pappus bristles to 10 mm long; achenes sericeous. Salt desert shrub communities at 1250 to 1985 m in Carbon, Daggett, Emery, Garfield, Grand, San Juan, Uintah, and Wayne counties; Colorado (a Colorado Plateau endemic); 99 (xv).